



US Army Corps
of Engineers

DTIC FILE COPY

AD-A227 475

TE
PROPOSED 9TH INF
MANEUVER DAMAGE, EROS
YAKIMA P

L. Jean O'Neil, Michael

Monte L. Pears

DE
Waterways E
3909 Halls Ferry

TECHNICAL REPORT EL-90-9

PROPOSED 9TH INFANTRY DIVISION FORCE CONVERSION,
MANEUVER DAMAGE, EROSION, AND NATURAL RESOURCES ASSESSMENT
YAKIMA FIRING CENTER, WASHINGTON

Volume II: PLATES

by

L. Jean O'Neil, Michael R. Waring, H. Glenn Hughes, Mary C. Landin

Environmental Laboratory

and

Monte L. Pearson, Patricia A. Morris, Robert J. Larson

Geotechnical Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



August 1990

Final Report



2

EL-90-9

ON FORCE CONVERSION,
URAL RESOURCES ASSESSMENT
WASHINGTON

ATES

nn Hughes, Mary C. Landin

oratory

eris, Robert J. Larson

oratory

HE ARMY
Corps of Engineers
Mississippi 39180-6199

DTIC
ELECTE
OCT 03 1990
S B D
Co

L. Jean O'Neil, MI

Monte L. F

Waterway
3909 Halls F

Appro

Prepar

L

90 05 138

Volume II: PLATES

by

L. Jean O'Neil, Michael R. Waring, H. Glenn Hughes, Mary C. Landin

Environmental Laboratory

and

Monte L. Pearson, Patricia A. Morris, Robert J. Larson

Geotechnical Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



August 1990

Final Report

Approved For Public Release; Distribution Unlimited

Prepared for DEPARTMENT OF THE ARMY
US Army Engineer District, Seattle
Seattle, Washington 98124-2255
Project No. E87-893153

PLATES

Glenn Hughes, Mary C. Landin

laboratory

Morris, Robert J. Larson

laboratory

THE ARMY
n, Corps of Engineers
g, Mississippi 39180-6199

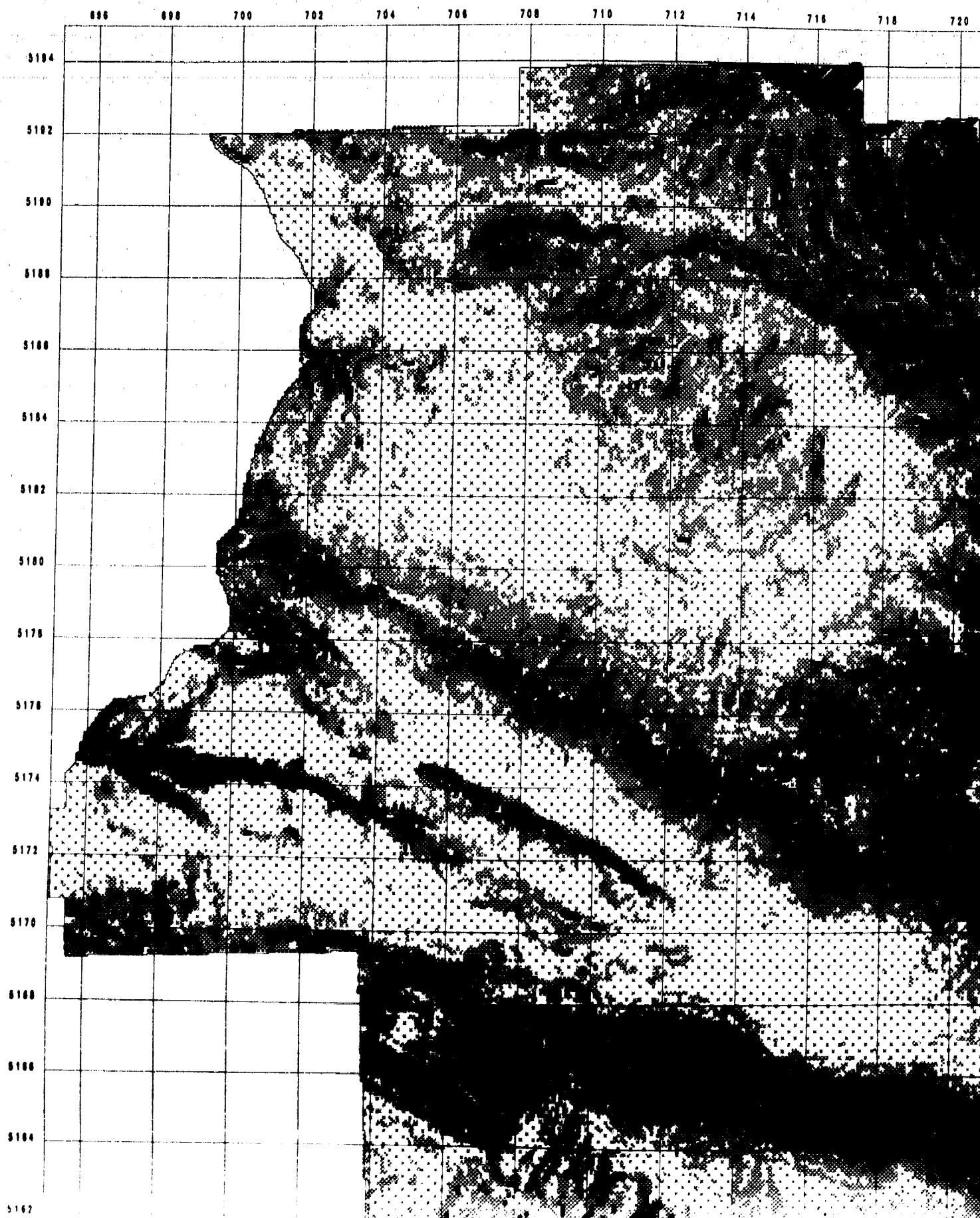
DTIC
ELECTE
OCT 03 1990
S B D
Co

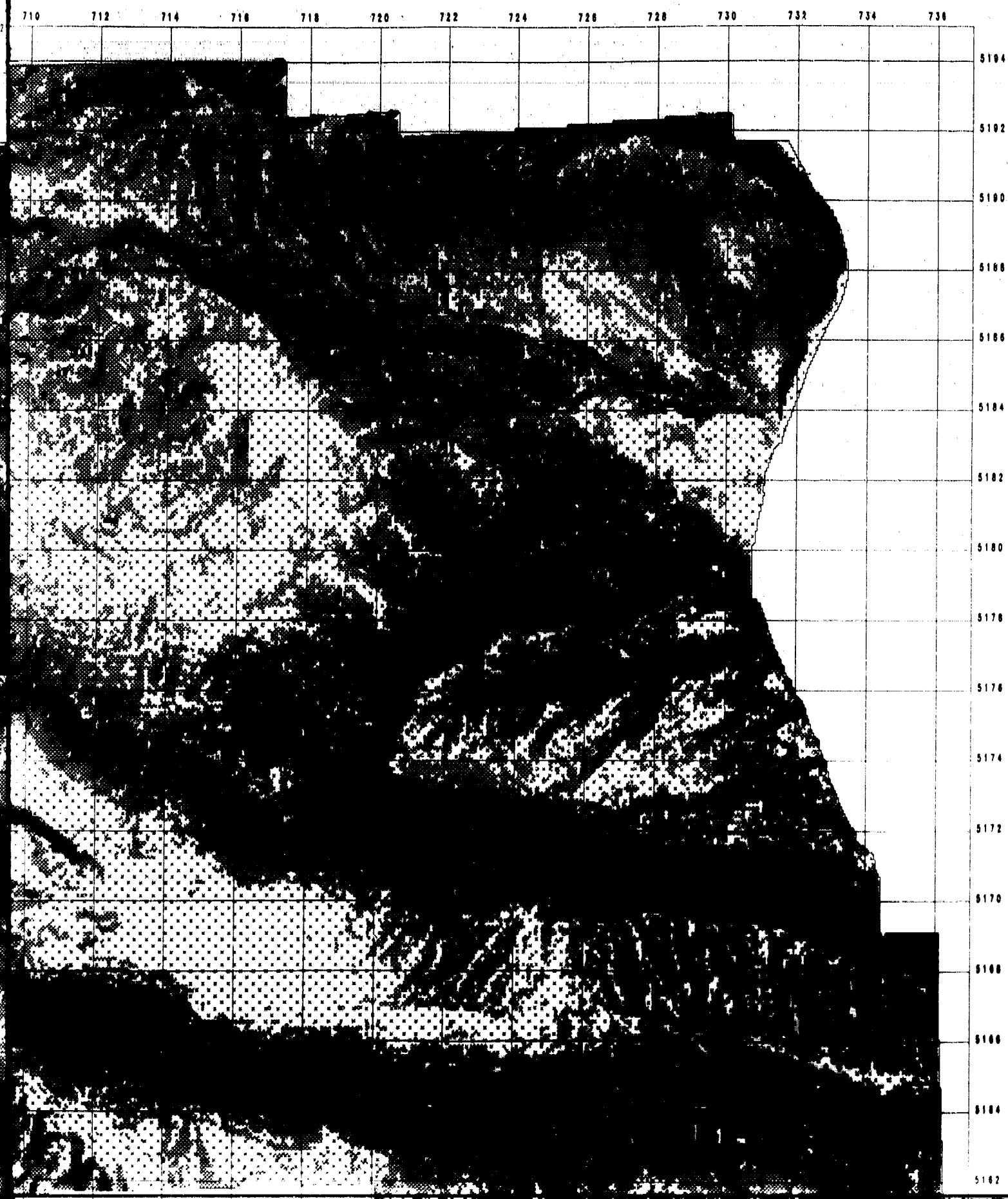
00

rt

tribution Unlimited

OF THE ARMY
istrict, Seattle
98124-2255
893153





732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SLOPE %

SCALE 1:100000



0-10



>10-20



>20

YAKIMA FIRING CENTER

Accession For

NTIS GRA&I ☒

DTIC TAB ☐

Unannounced ☐

Justification ☐

By

Distribution/

Availability Codes

Dist

Avail and/or
Special

A-1



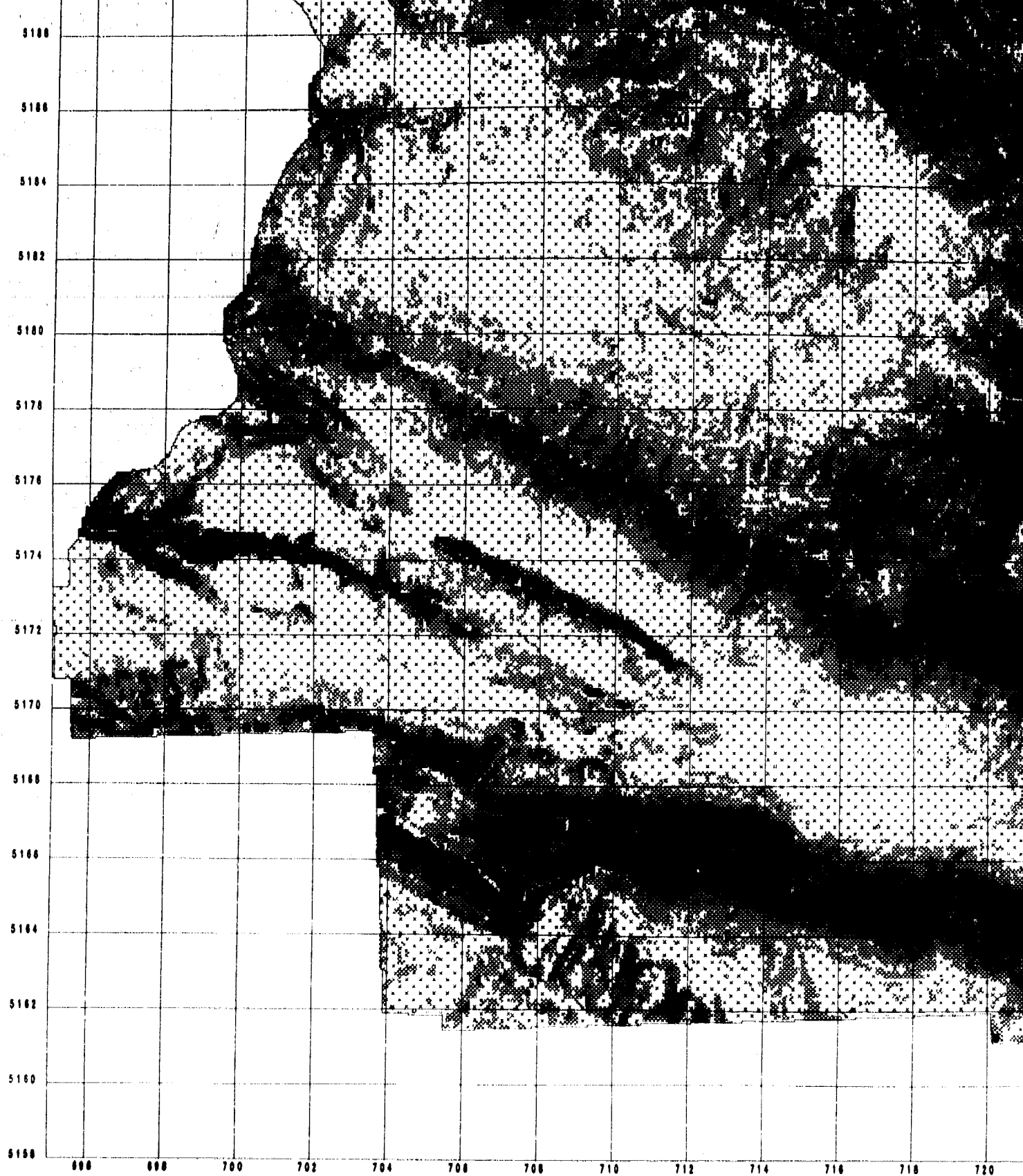


Plate 1. Slope m

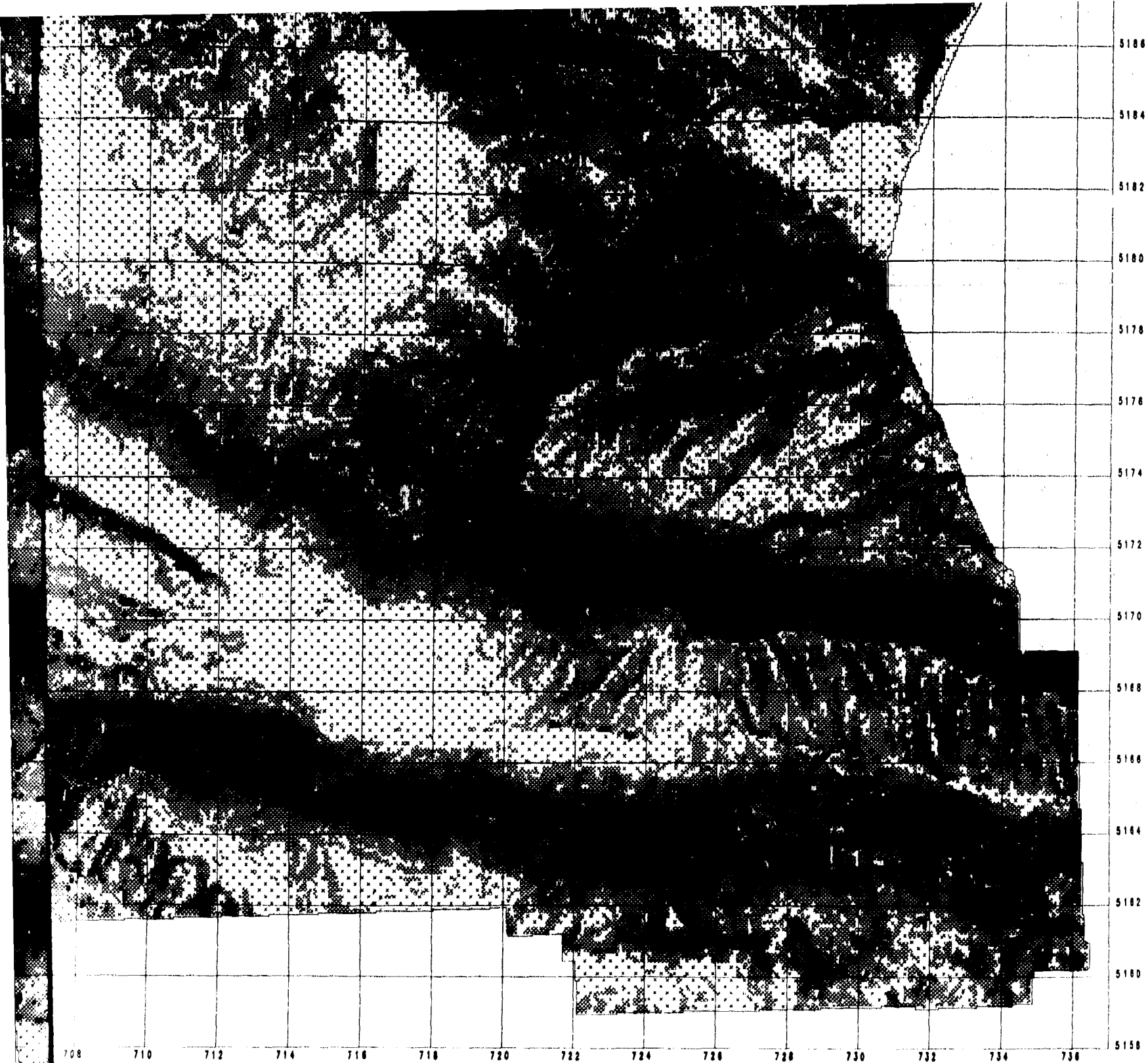
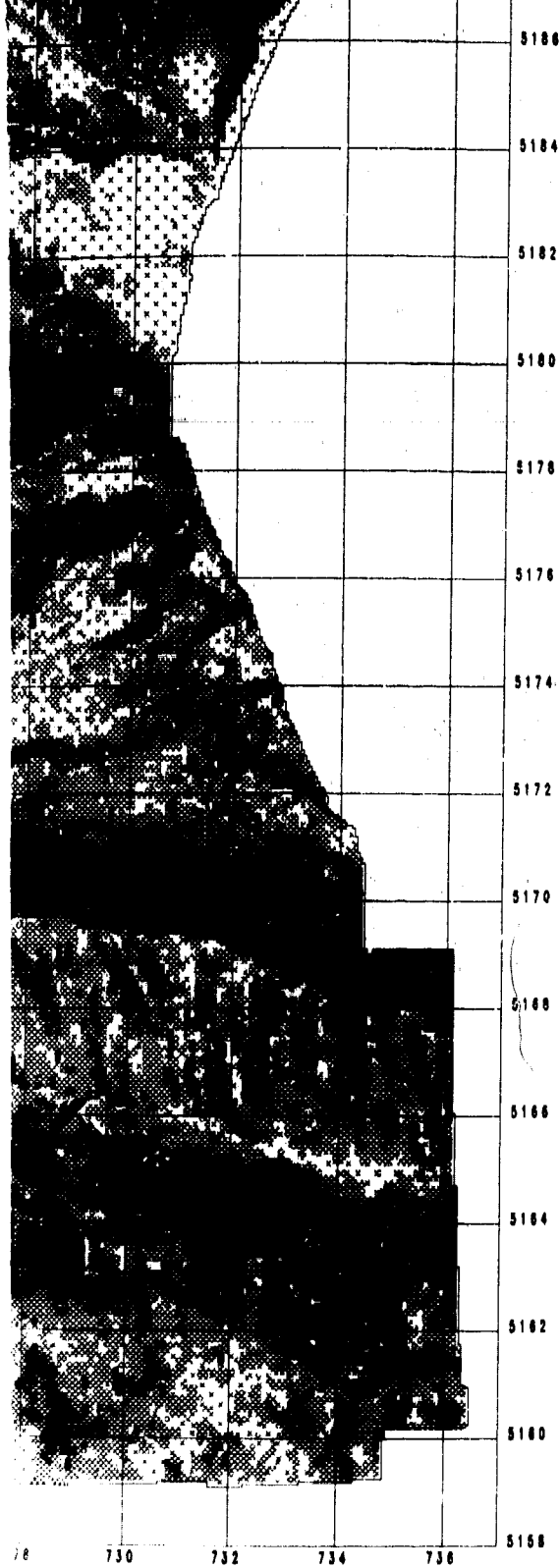


Plate 1. Slope map for Yakima Firing Center study area

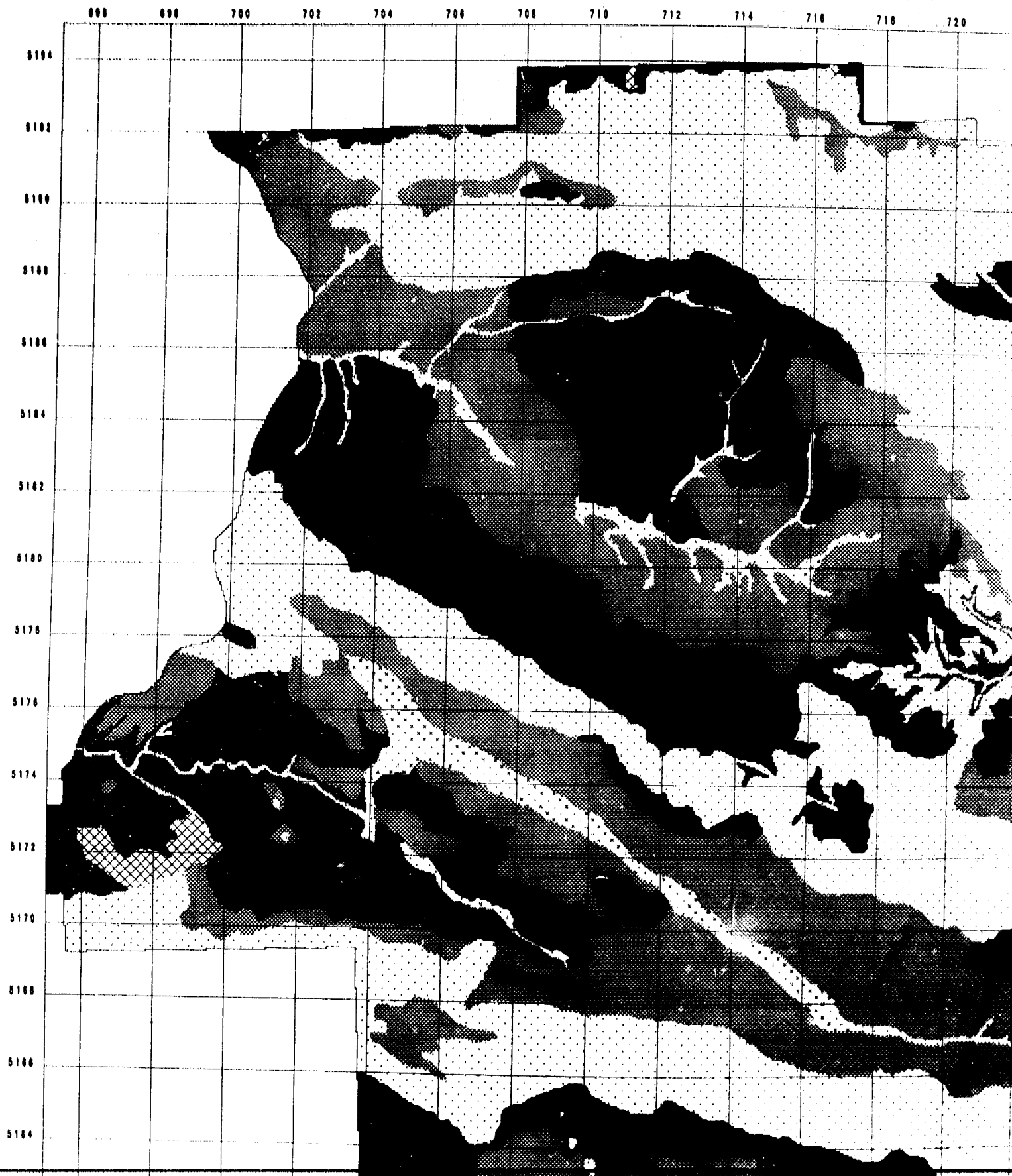


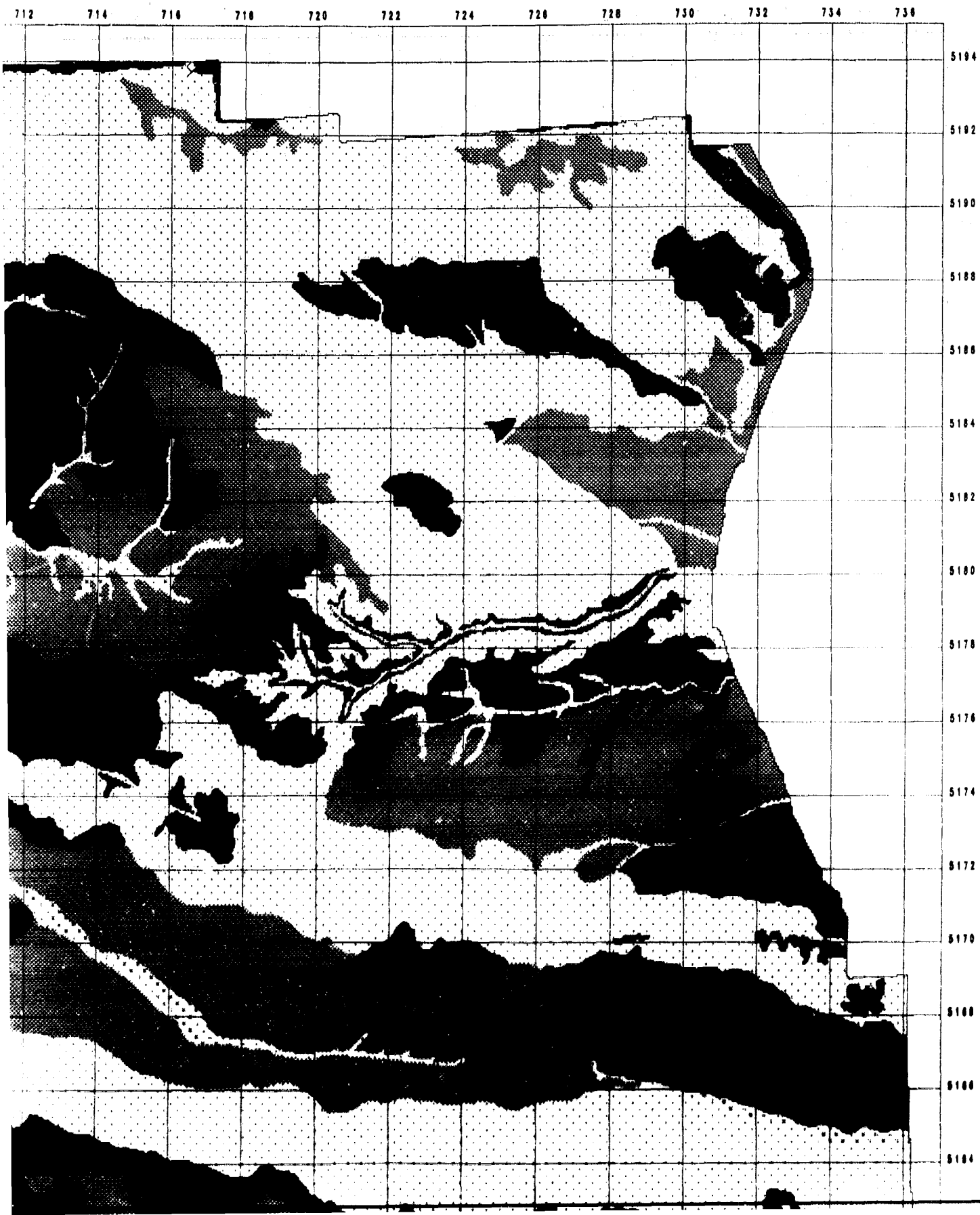
study area

YAKIMA FIRING CENTER

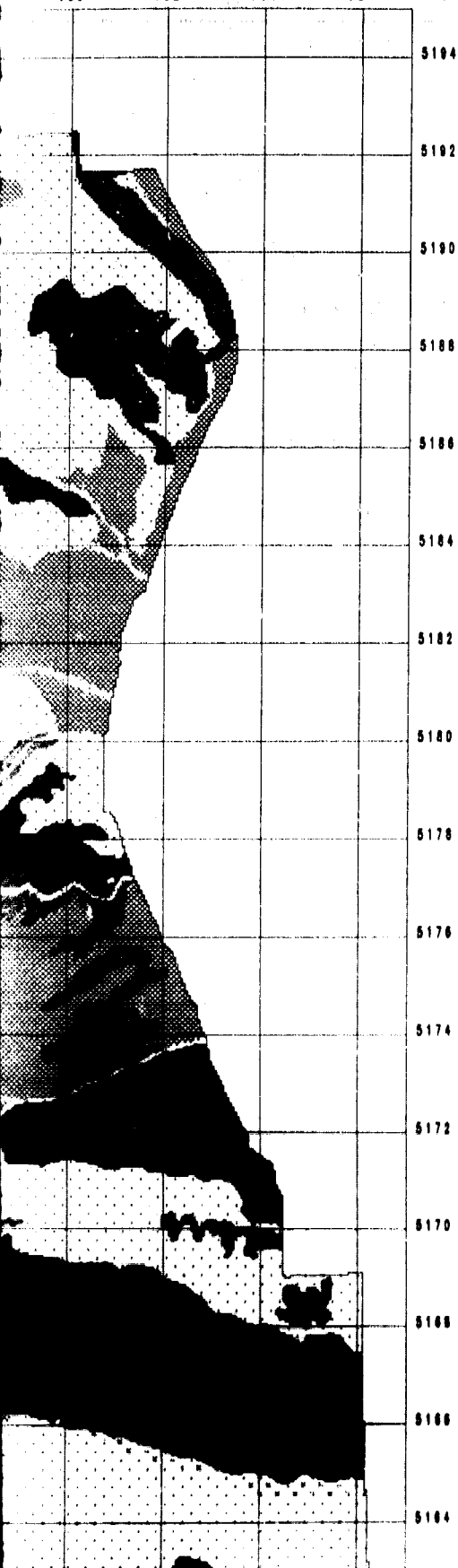
Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	







730 732 734 738



U. S. Army Corps of Engineers
Waterways
Experiment
Station

USCS SOIL TYPE
SCALE 1:100000



GP



SM



CL



ML



CLML



ROCK



GW



GC

YAKIMA FIRING CENTER

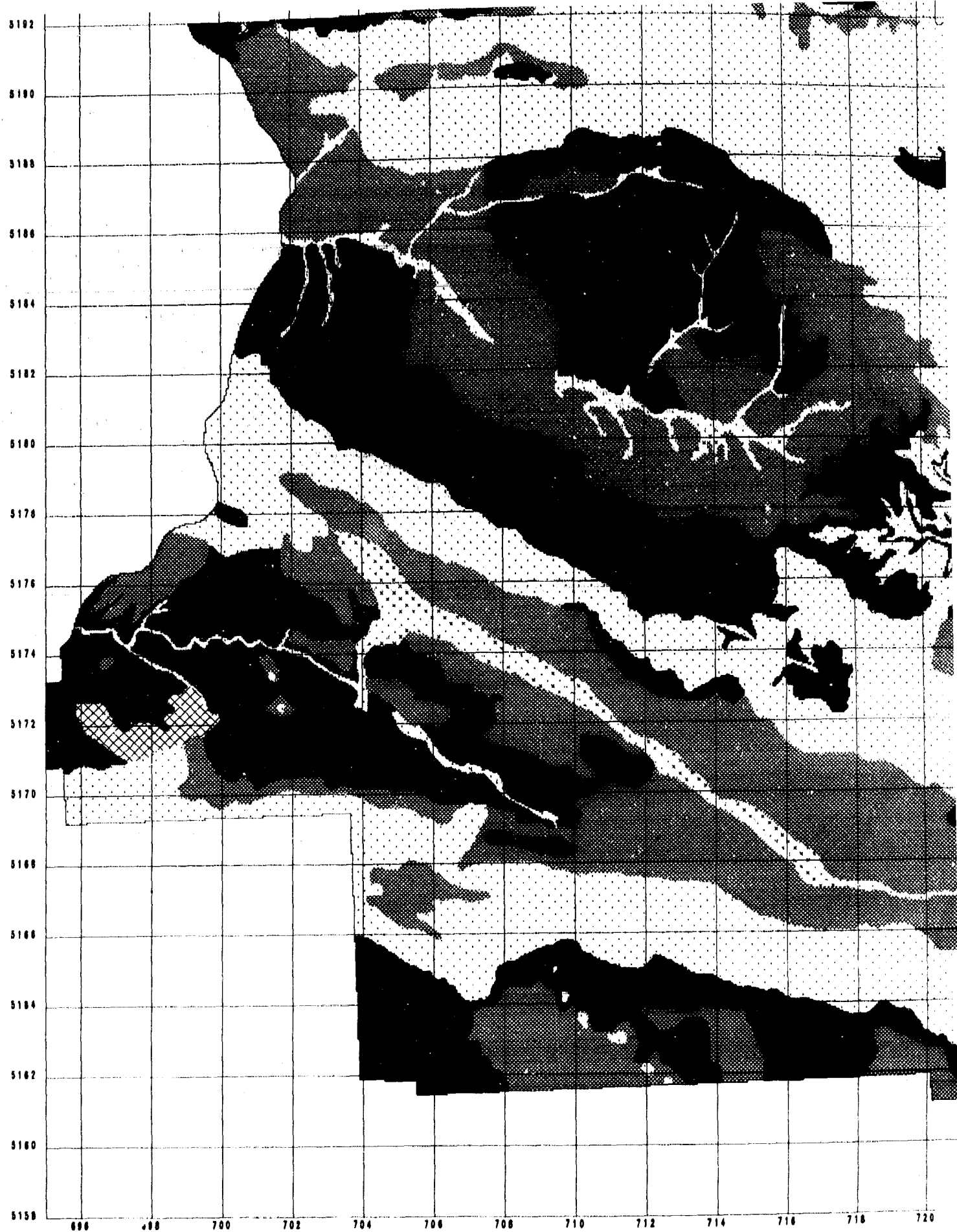


Plate 2. Spatial distribution

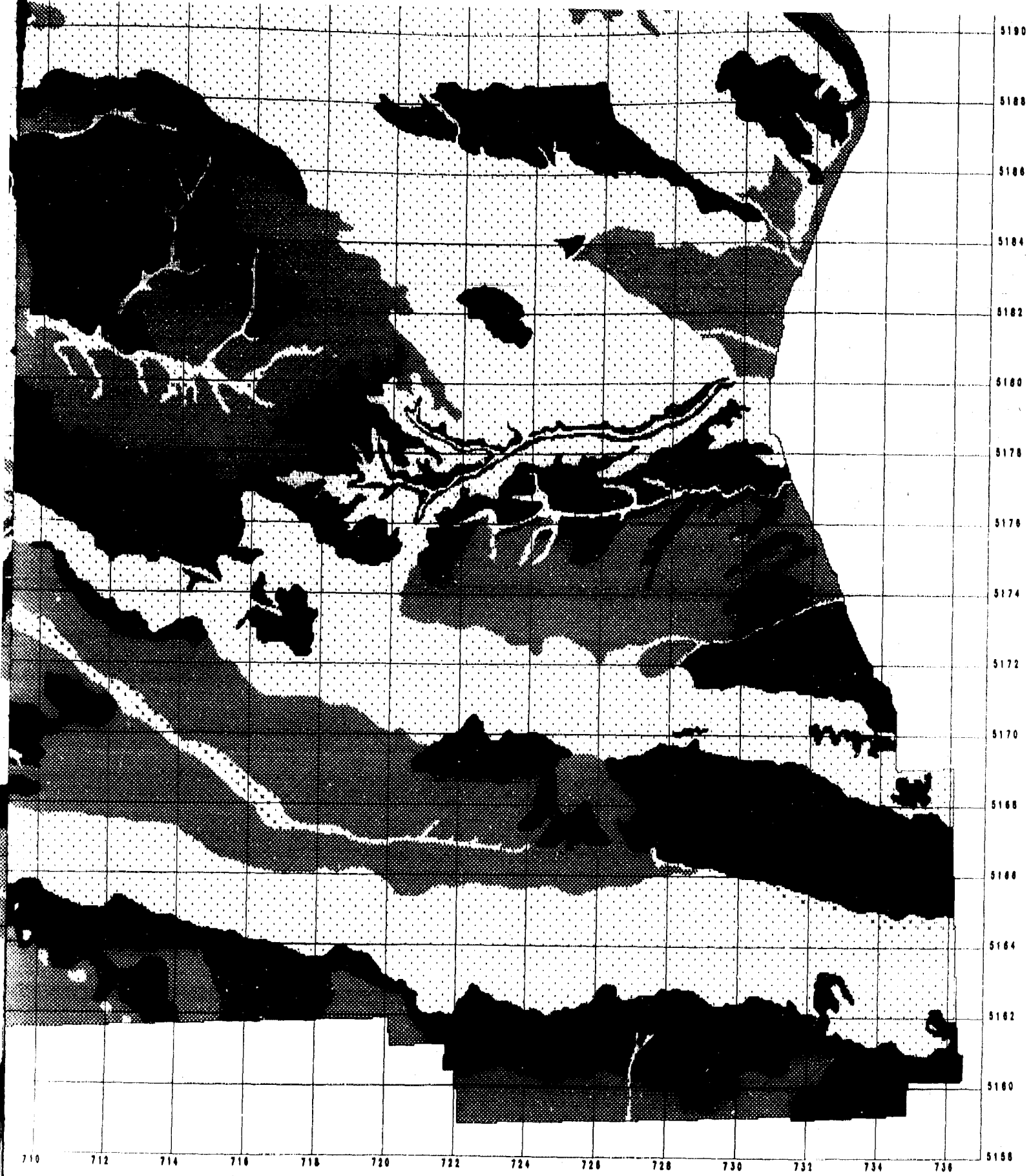
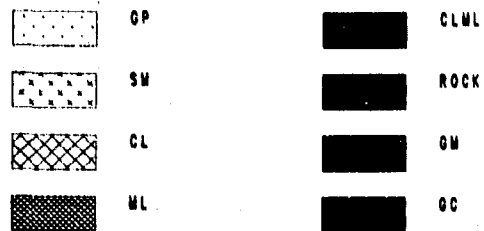
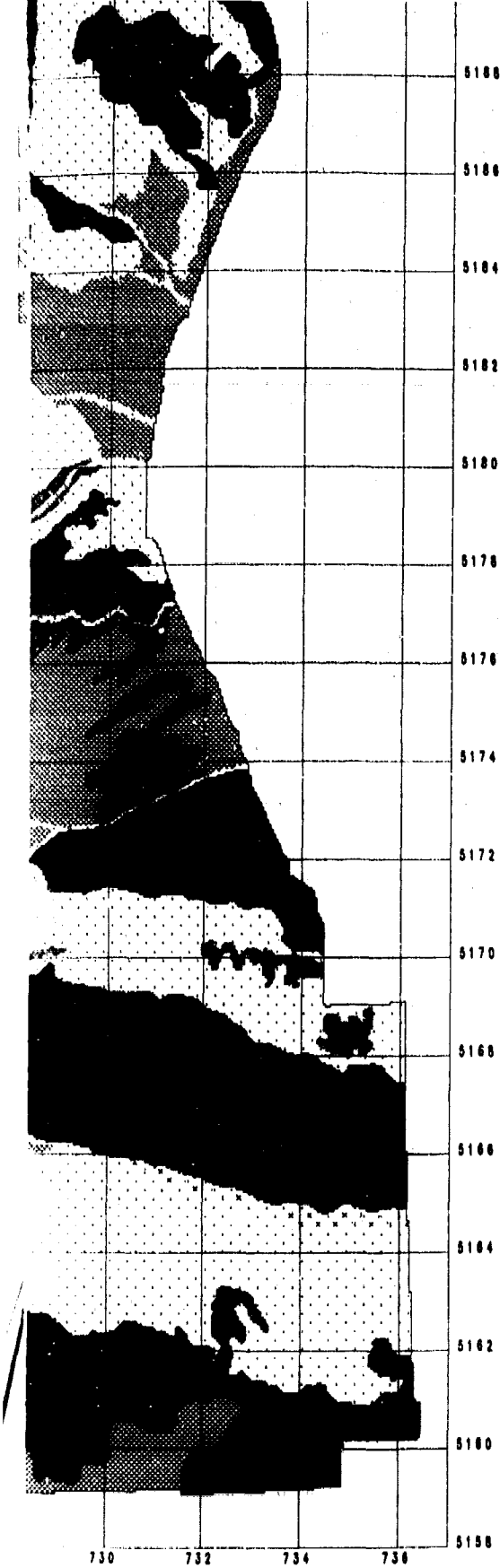


Plate 2. Spatial distribution of soil types for Yakima Firing Center study area

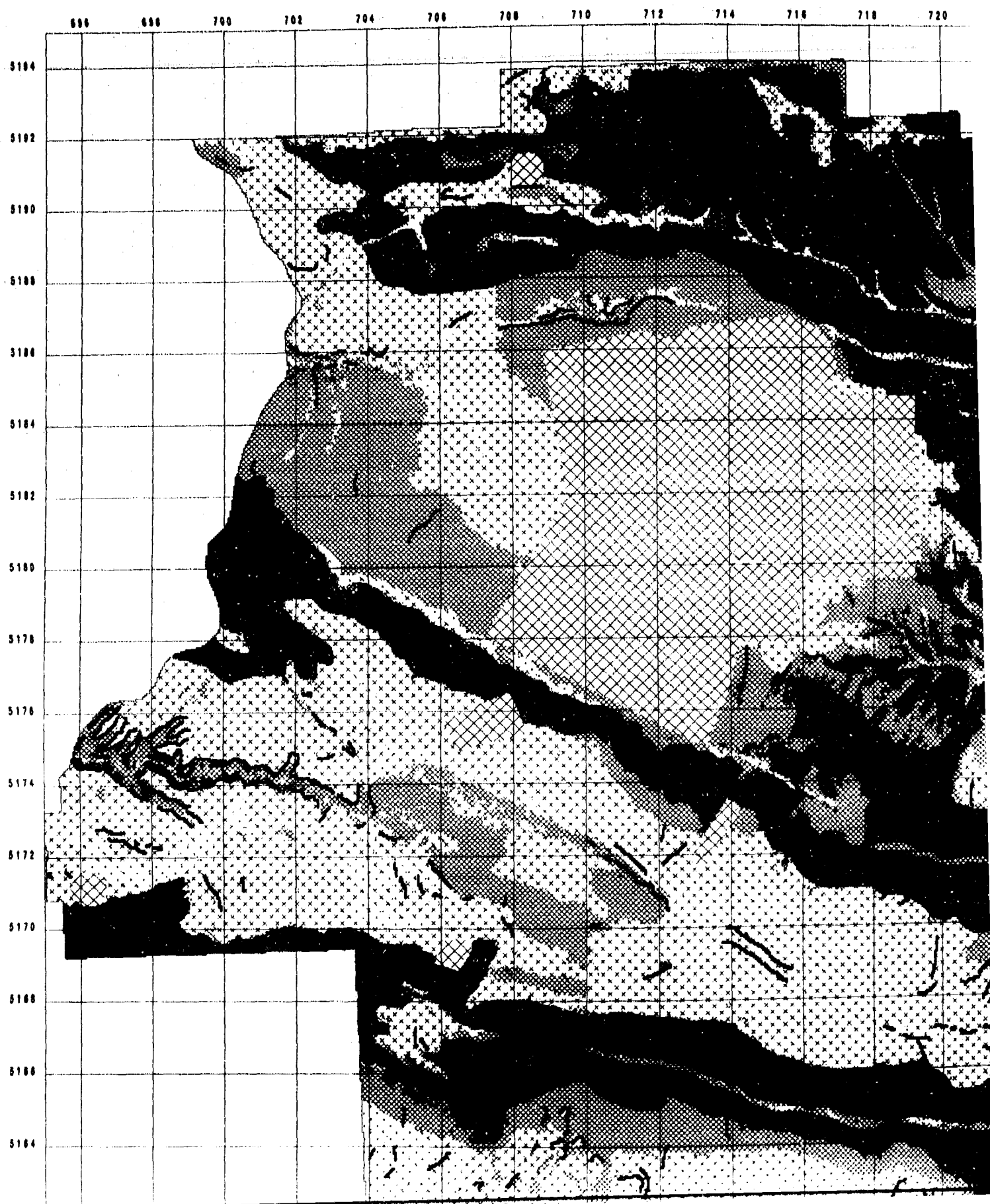
SCALE 1:100000

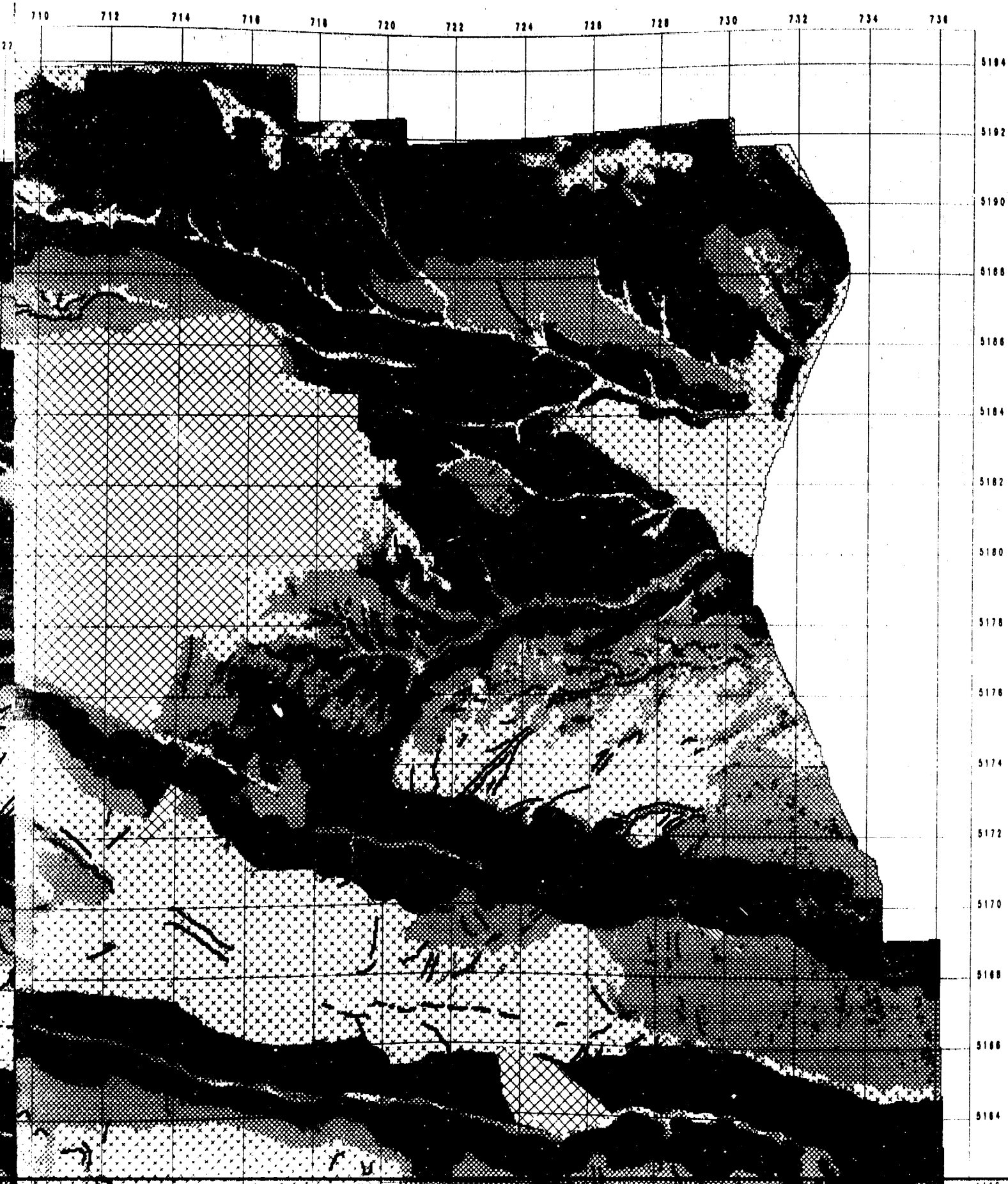


YAKIMA FIRING CENTER



ring Center study area





30 32 34 36

5190

5192

5190

5188

5188

5188

5188

5188

5178

5178

5178

5172

5170

5168

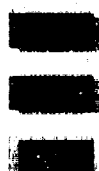
5166

5164



U.S. Army Corps of Engineers
Wentworth
Experiment
Station

SPEED (MPH)
SCALE 1:100000



10 20

0 0

10

UPON

YARIMA SPEED CENTER

SPEED (MPH)

YARIMA

YARIMA

YARIMA

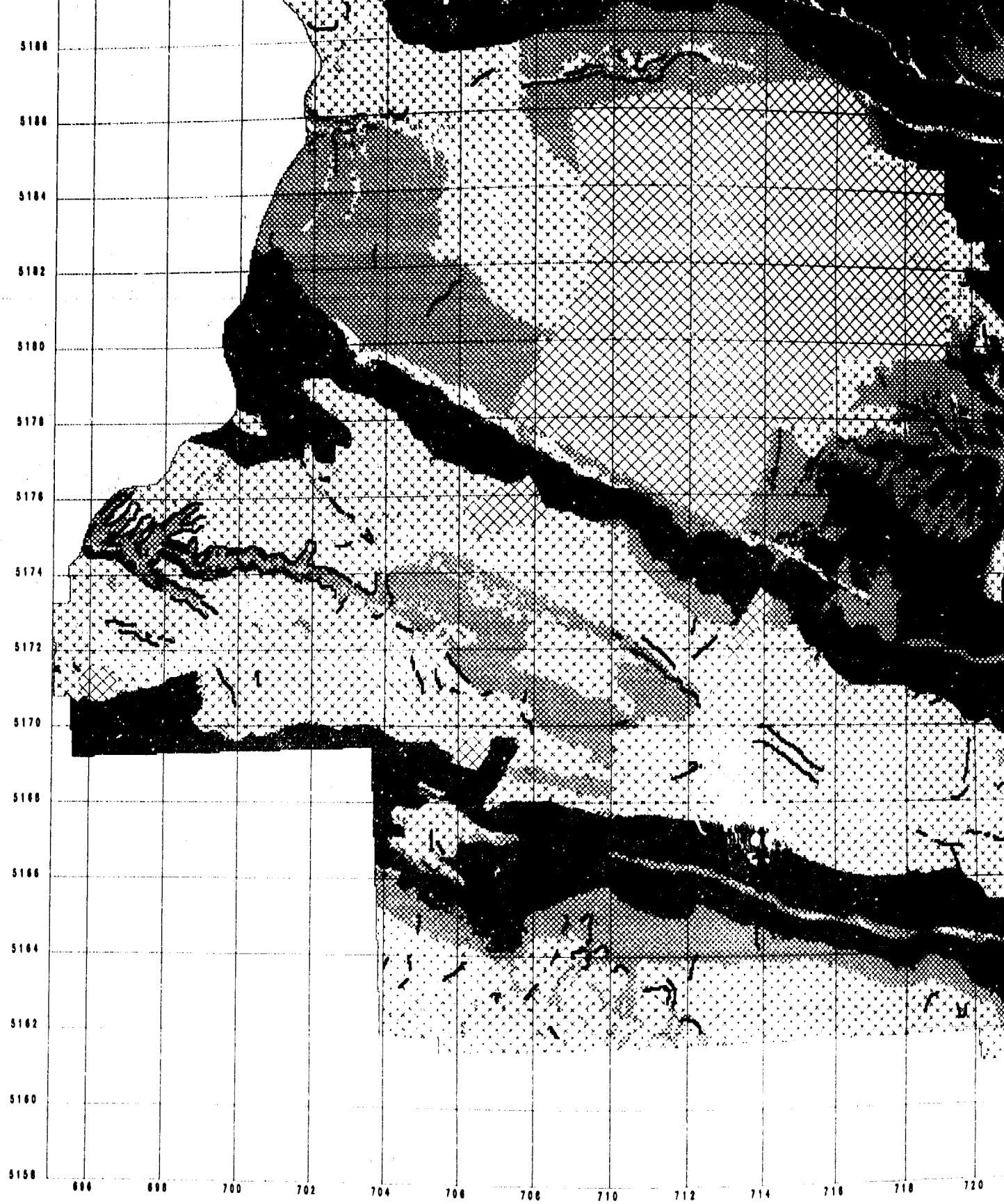


Plate 3. Speed map for M998 (HMM)

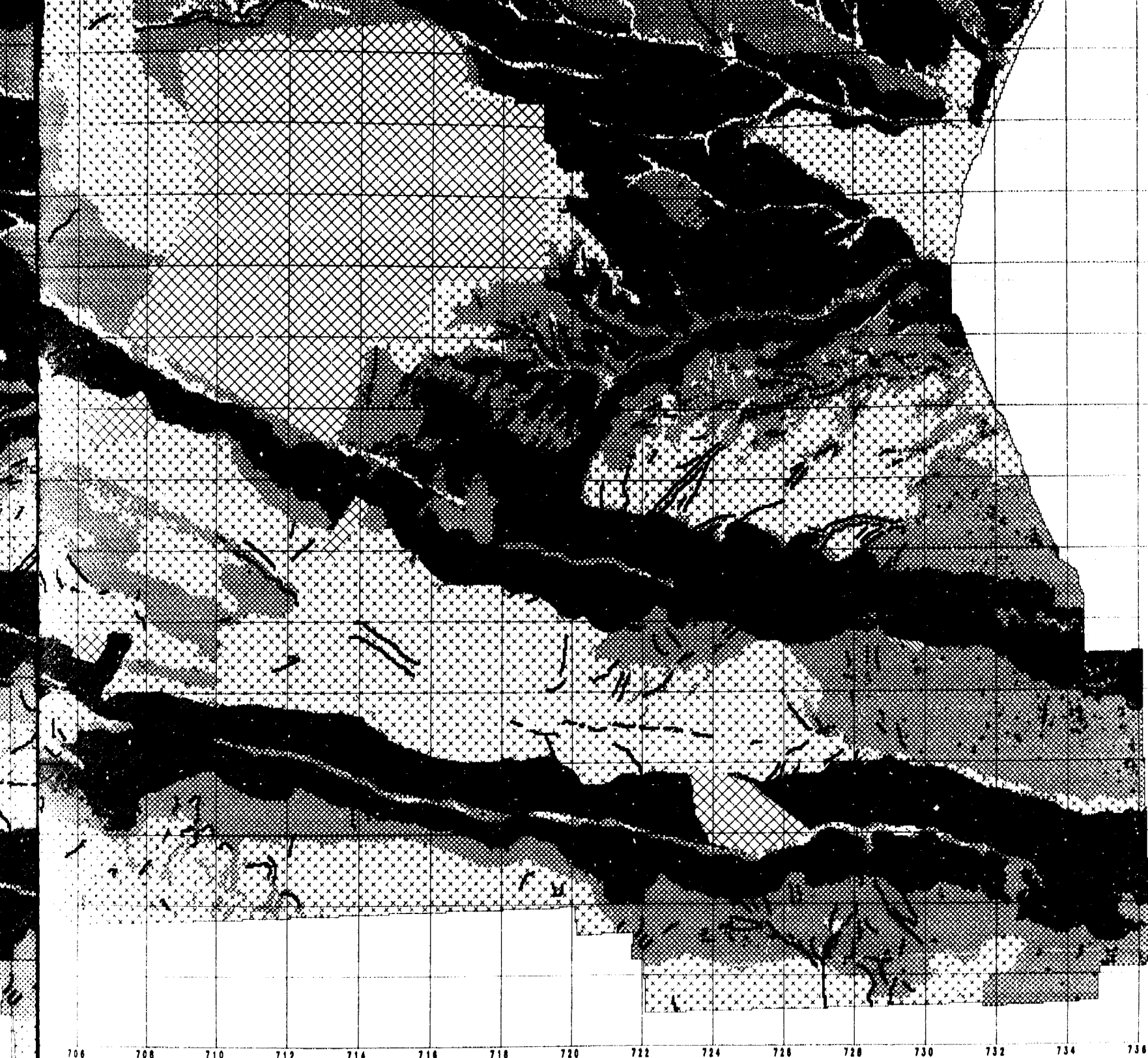
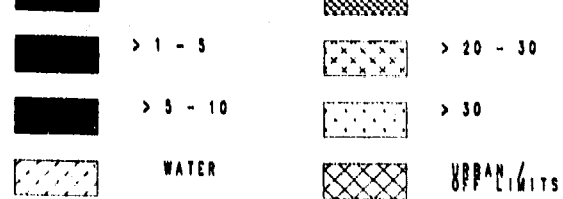
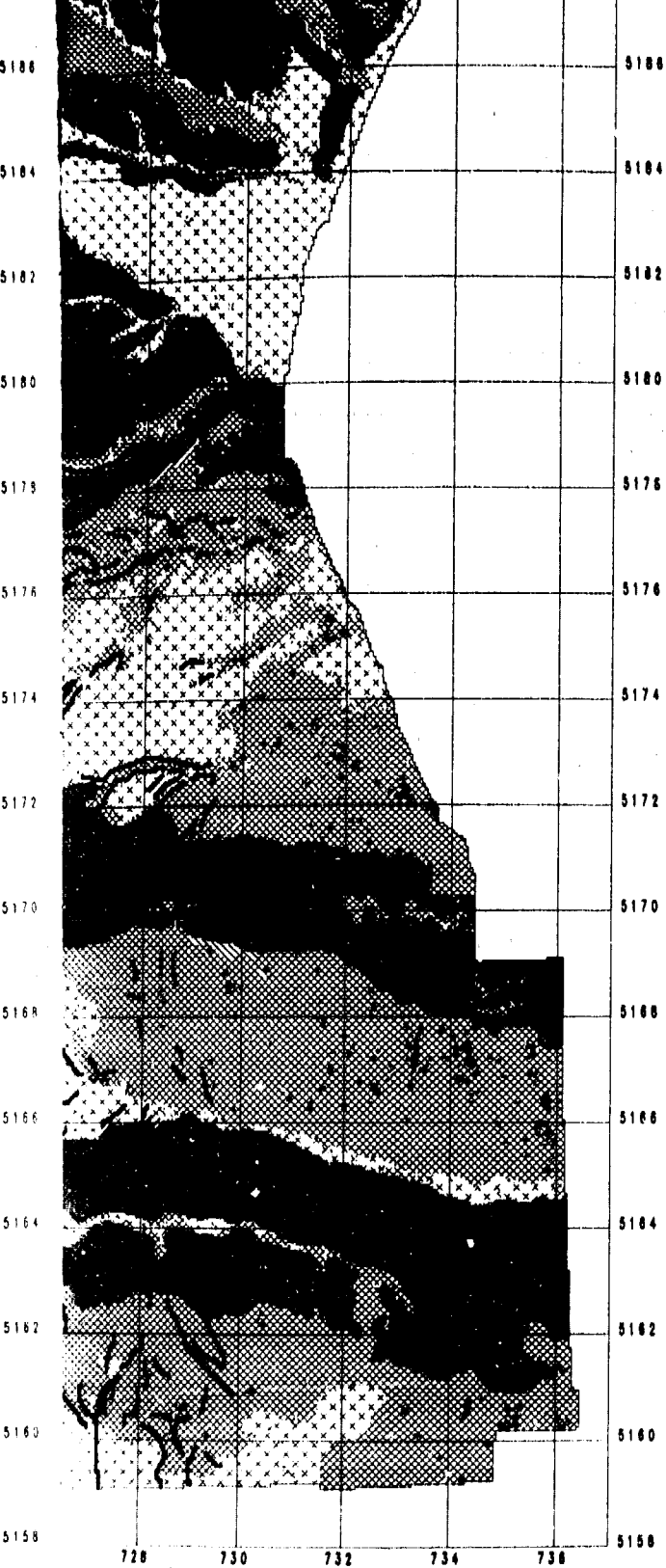


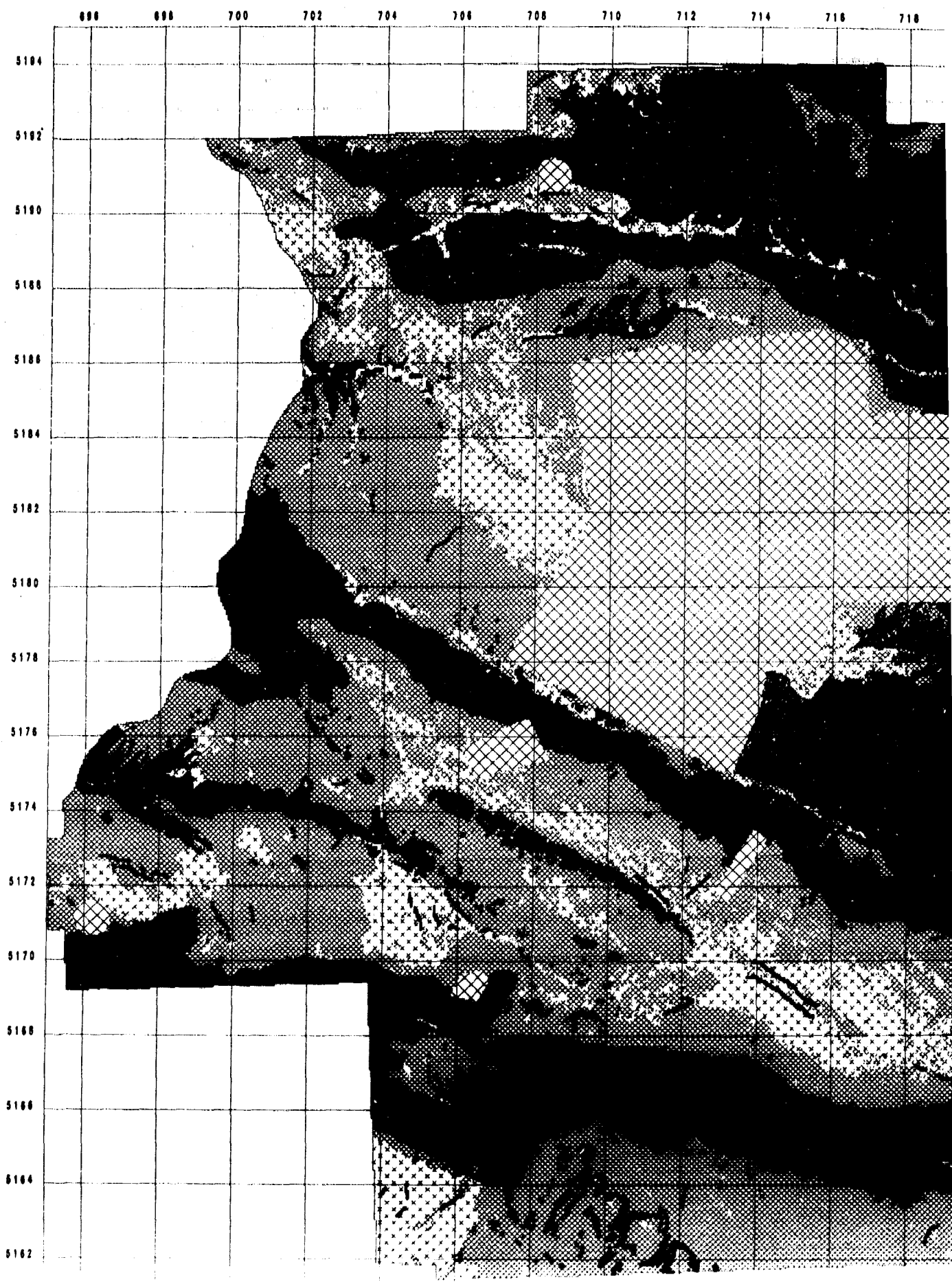
Plate 3. Speed map for M998 (HMMWV) wheeled vehicle in the dry normal surface condition



YAKIMA FIRING CENTER
SPEED MAP
HMMWV
DRY SEASON
NORMAL CONDITION



the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

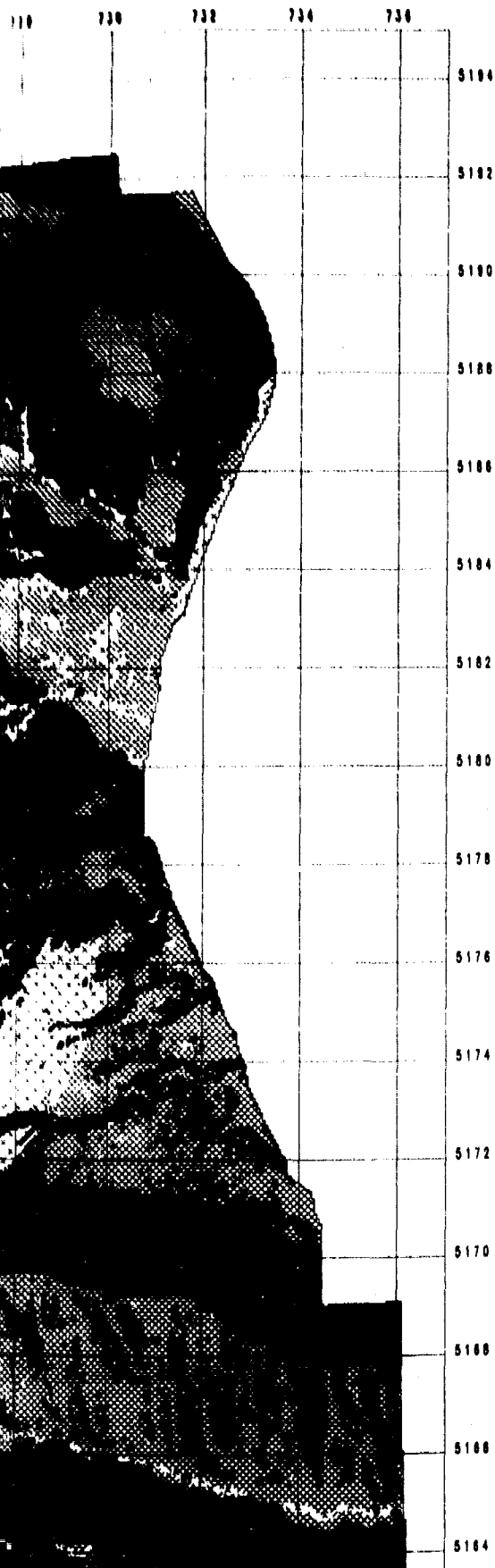
5170

5168

5166









5164

5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)
SCALE 1:100000

	< 1		> 10 - 20
	> 1 - 5		> 20 - 30
	> 5 - 10		> 30
	WATER		URBAN / OFF LIMITS

YAKIMA FIRING CENTER
SPEED MAP
HMMWV
WET-WET SEASON
SLIPPERY CONDITION

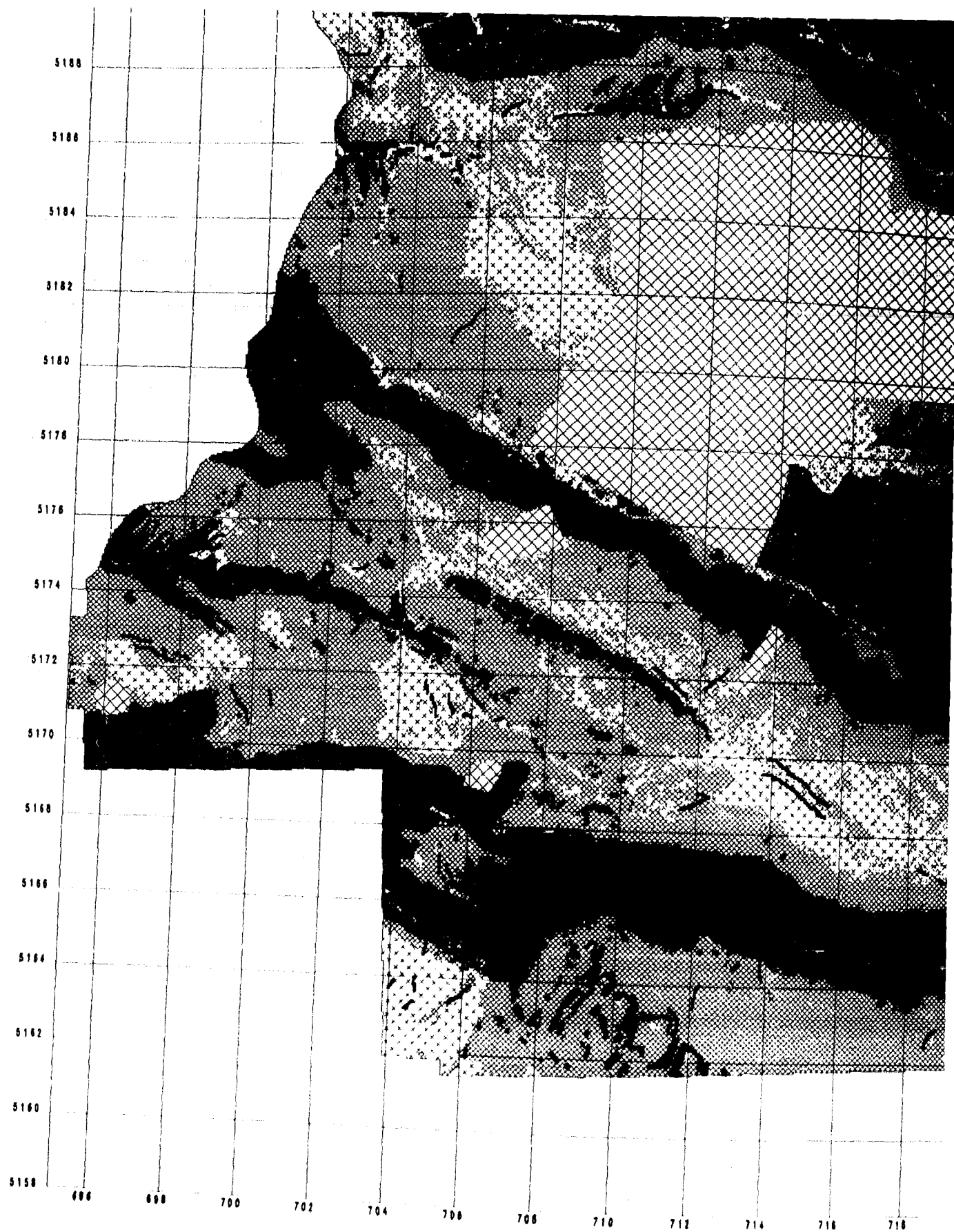


Plate 4. Speed map for M998

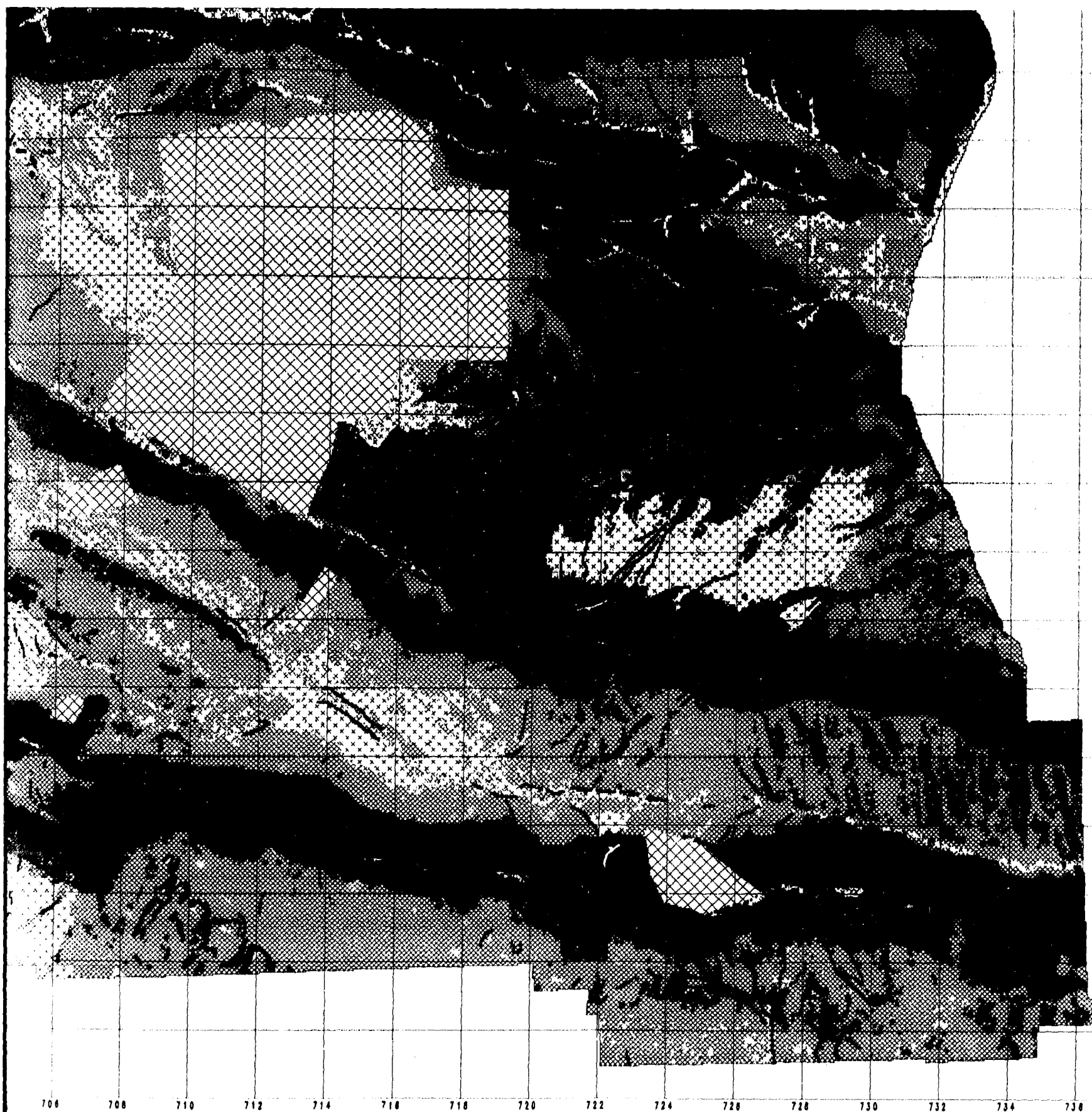
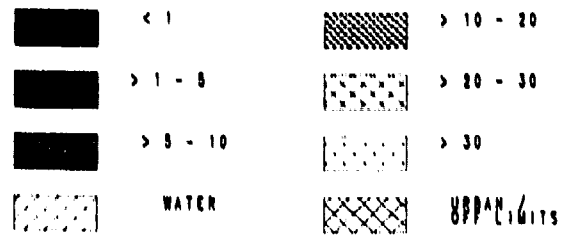


Plate 4. Speed map for M998 (HMMWV) wheeled vehicle in the wet-wet slippery surface condition

SCALE 1:100000



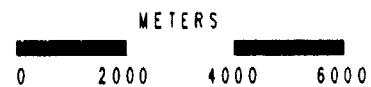
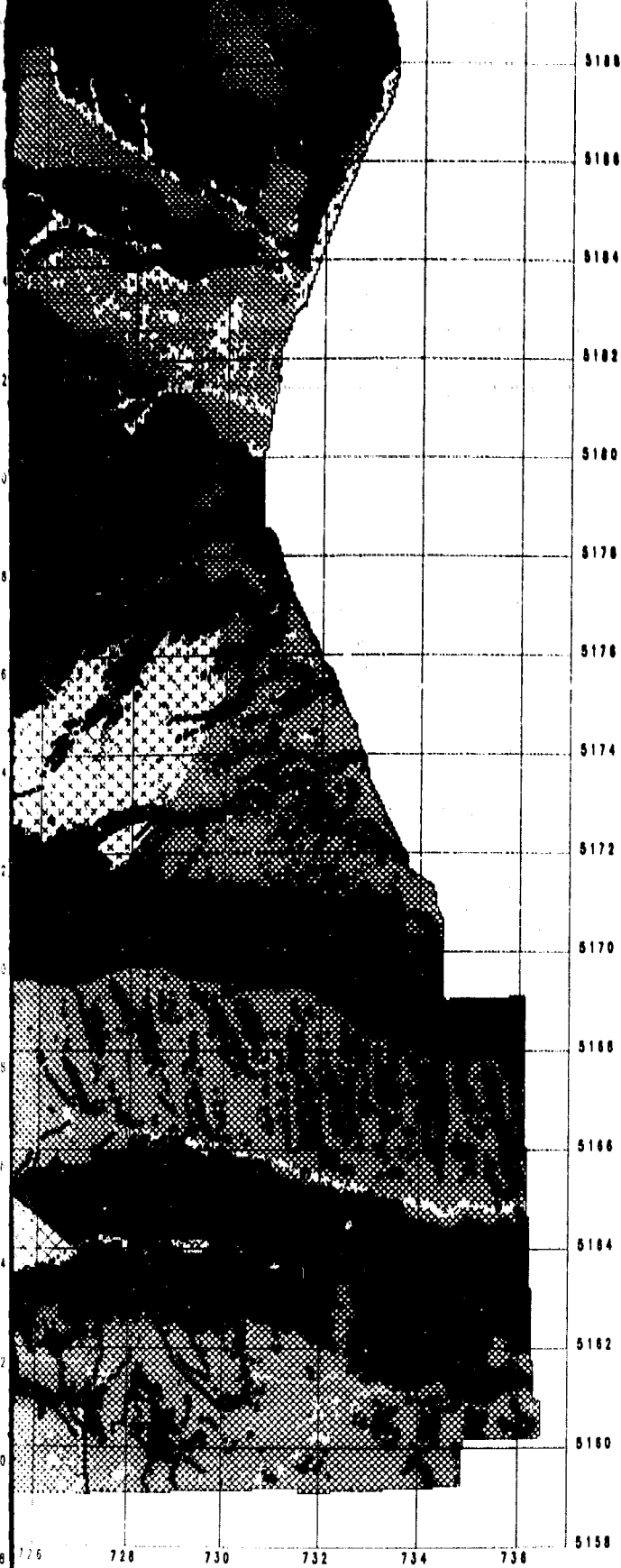
YAKIMA FIRING CENTER

SPEED MAP

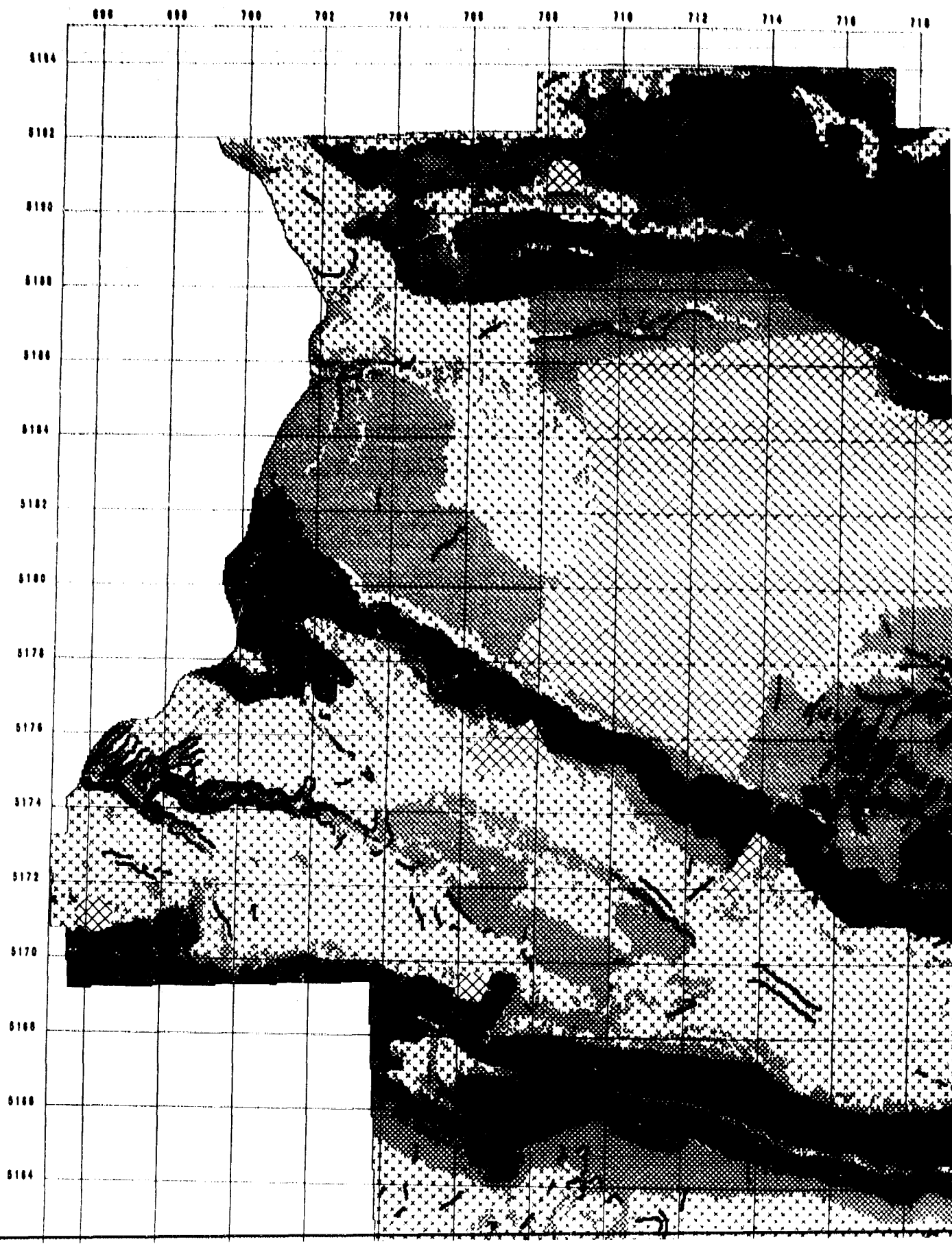
HMMWV

WET-WET SEASON

SLIPPERY CONDITION



in the wet-wet slippery surface condition



712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

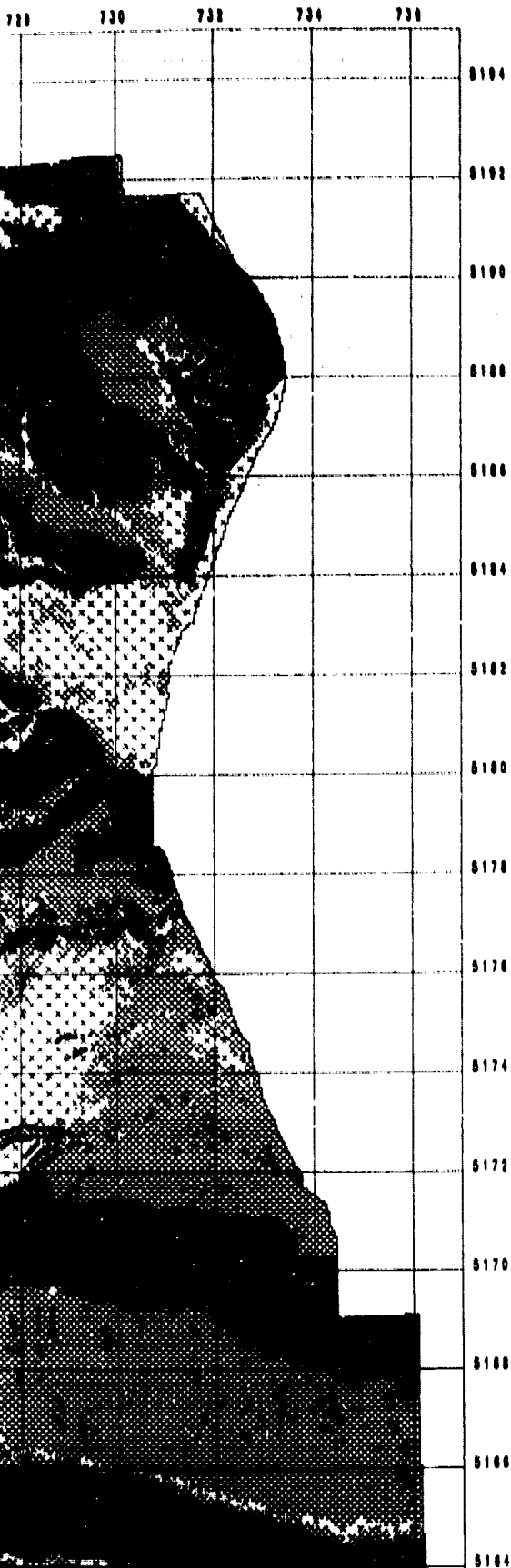
5170

5168

5166

5164













U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000

	< 1		> 10 - 20
	> 1 - 5		> 20 - 30
	> 5 - 10		> 30
	WATER		URBAN / OFF LIMITS

YAKIMA FIRING CENTER

SPEED MAP

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

NORMAL CONDITION

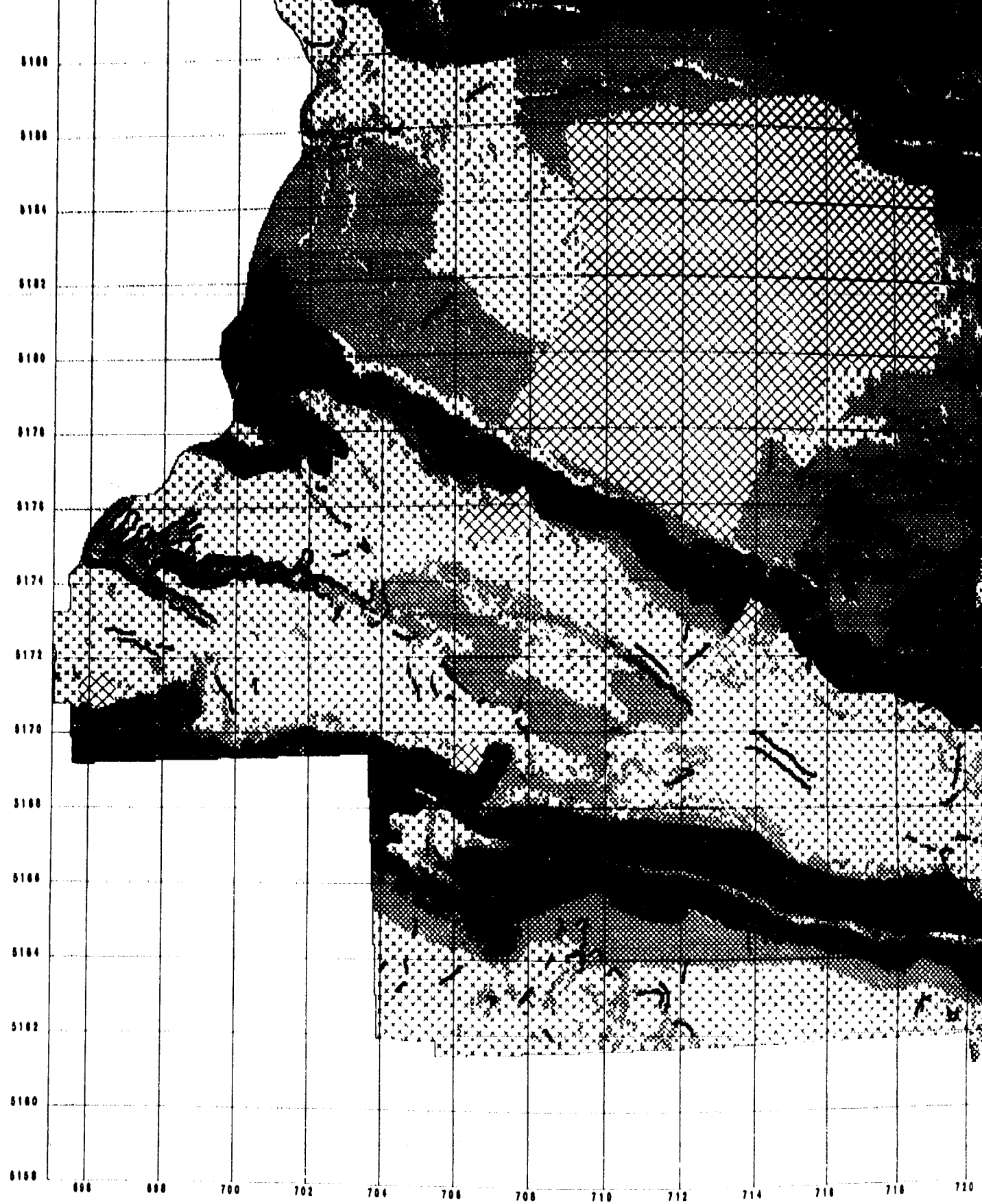


Plate 5. Speed map for 8X8

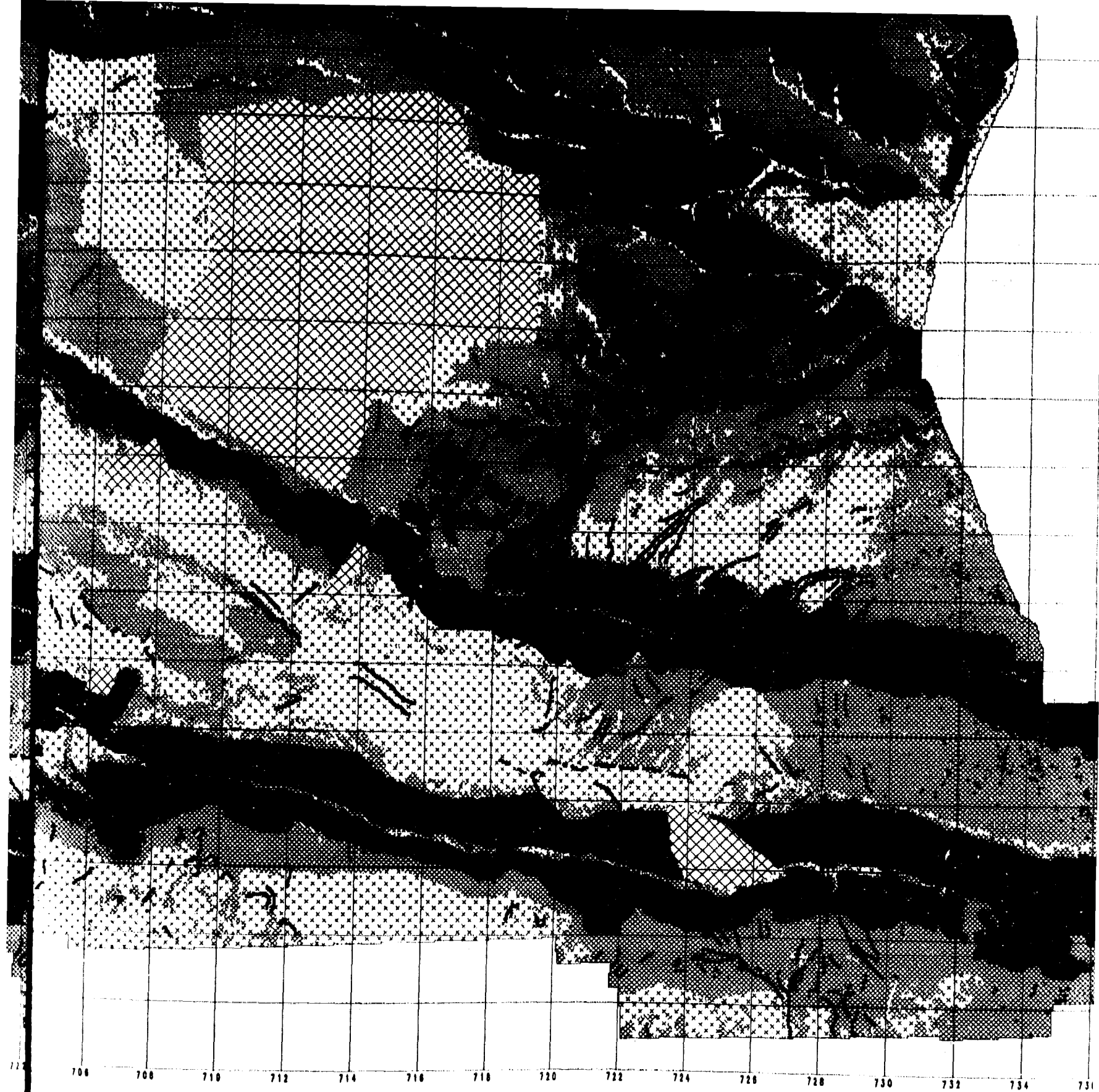
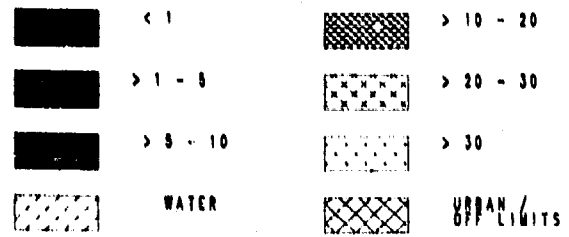


Plate 5. Speed map for 8X8 wheeled combat vehicle in the dry normal surface condition

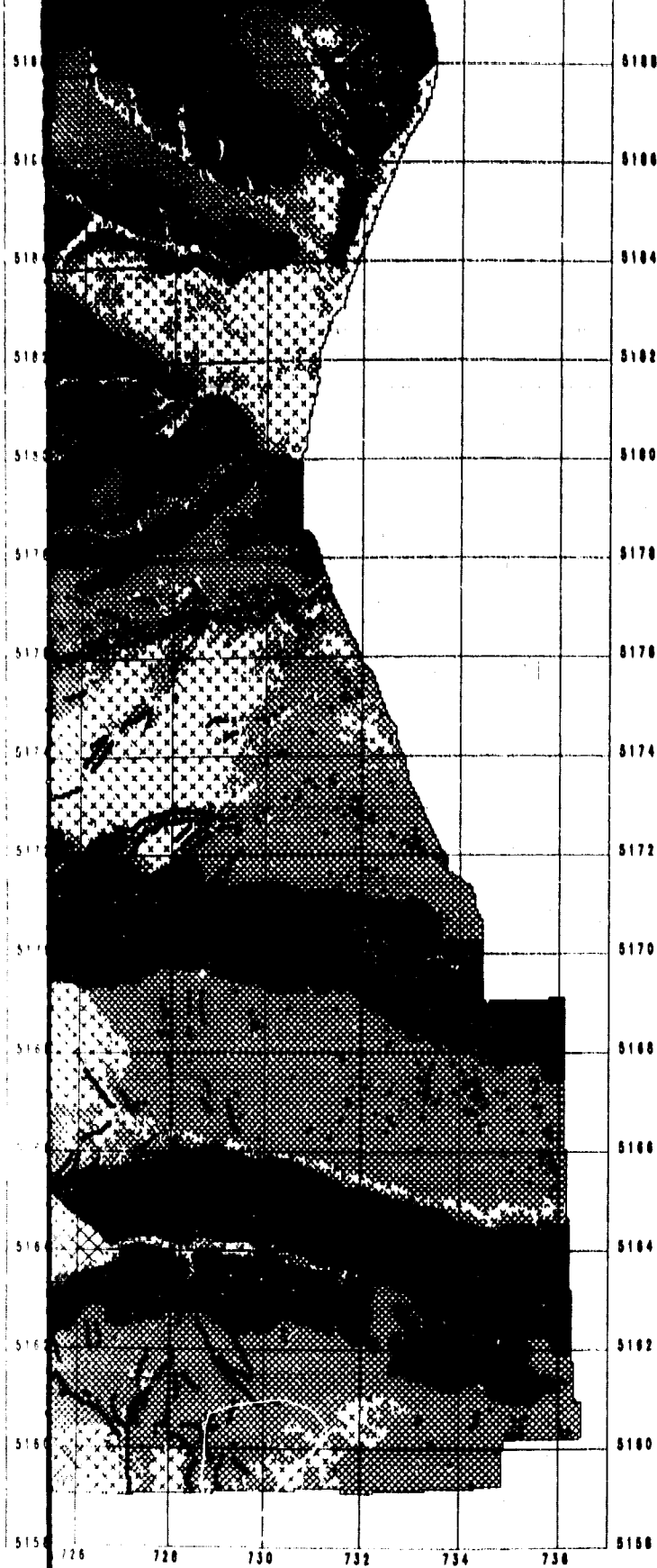
SCALE 1:100000



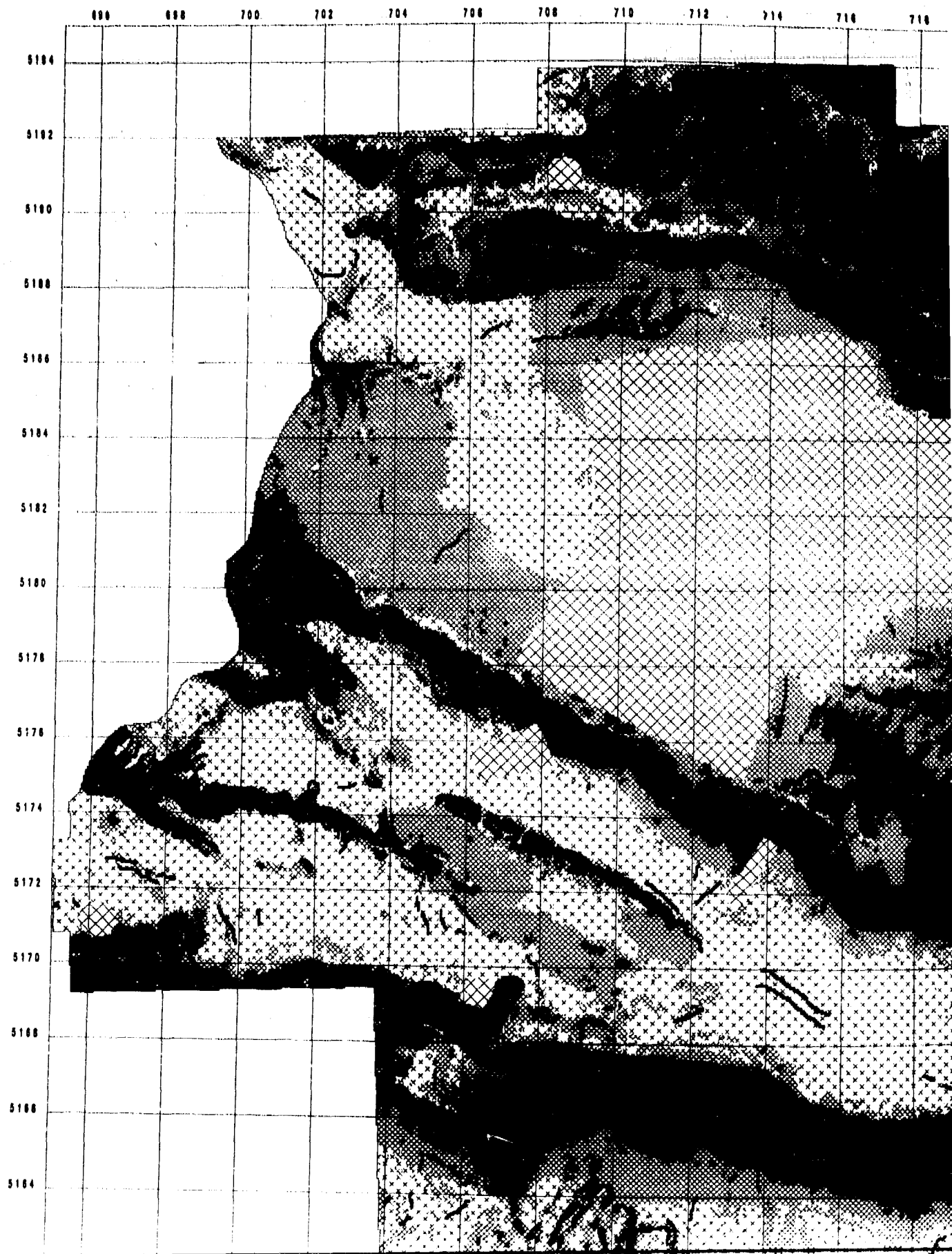
YAKIMA FIRING CENTER

SPEED MAP

8X8 WHEELED COMBAT VEHICLE
 DRY SEASON
 NORMAL CONDITION



le in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5186

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162

728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164









5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000

	< 1		> 10 - 20
	> 1 - 5		> 20 - 30
	> 5 - 10		> 30
	WATER		URBAN / OFF LIMITS

YAKIMA FIRING CENTER

SPEED MAP

8X8 WHEELED COMBAT VEHICLE
WET-WET SEASON
SLIPPERY CONDITION

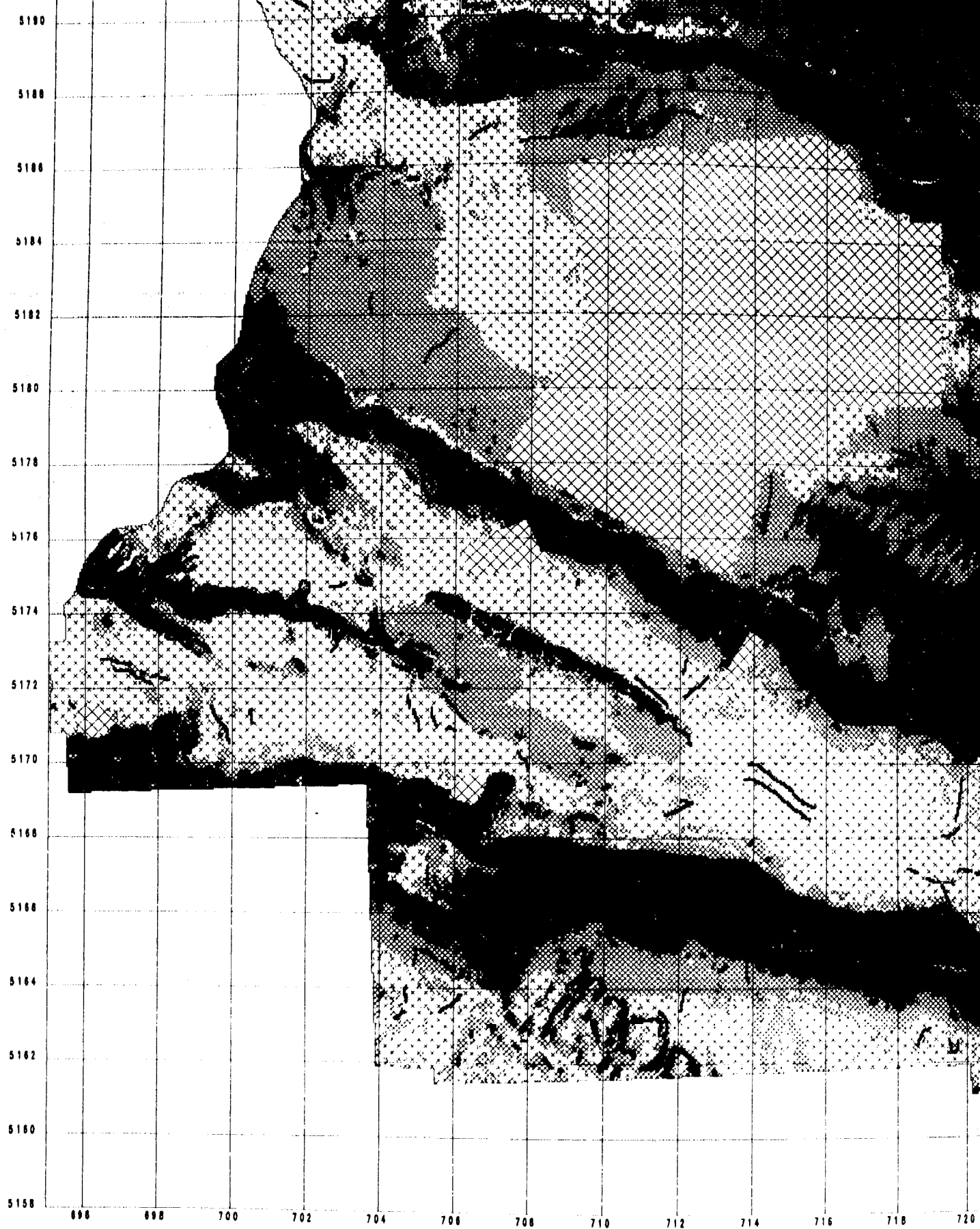


Plate 6. Speed map for 8X8 wheel

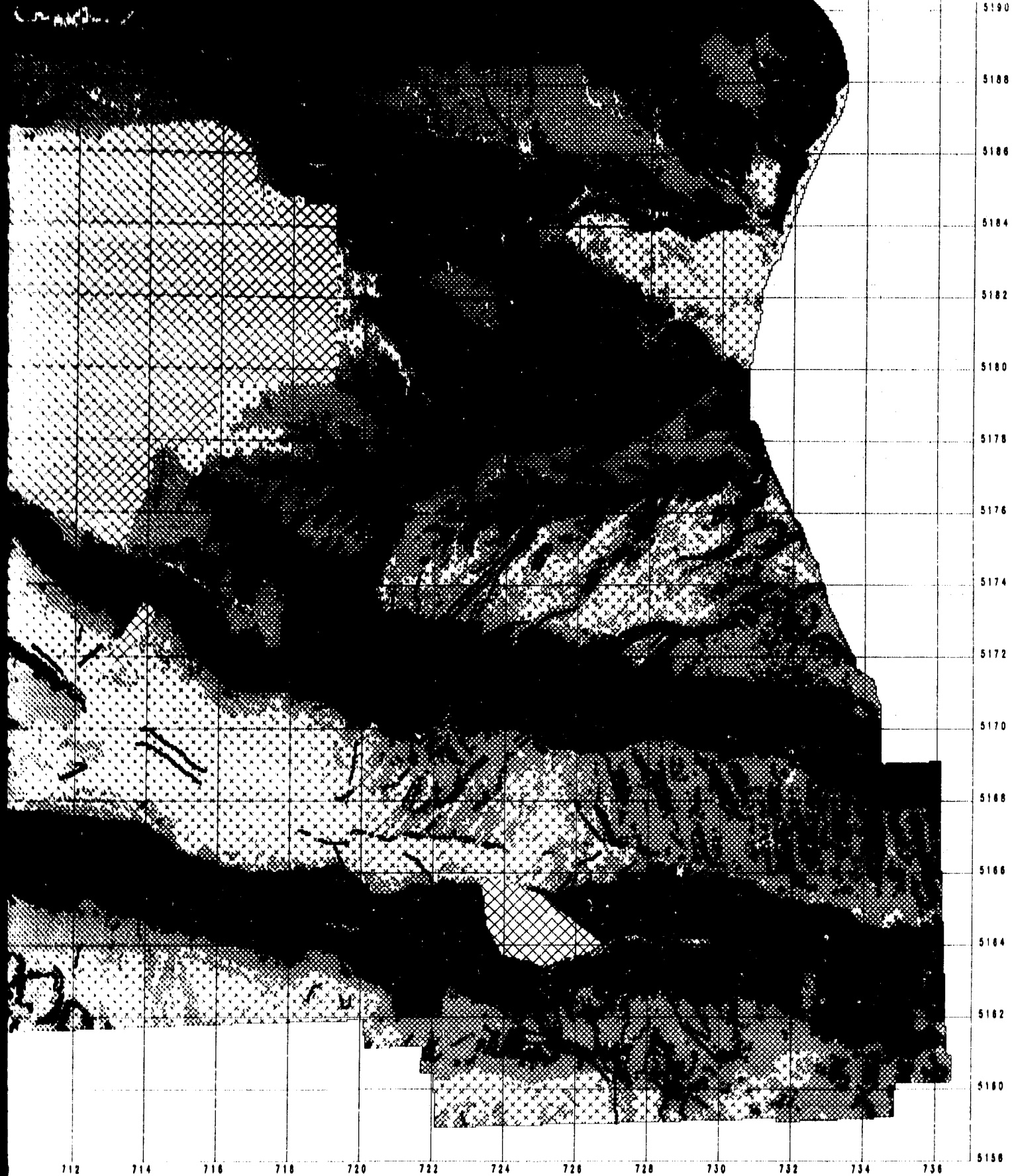
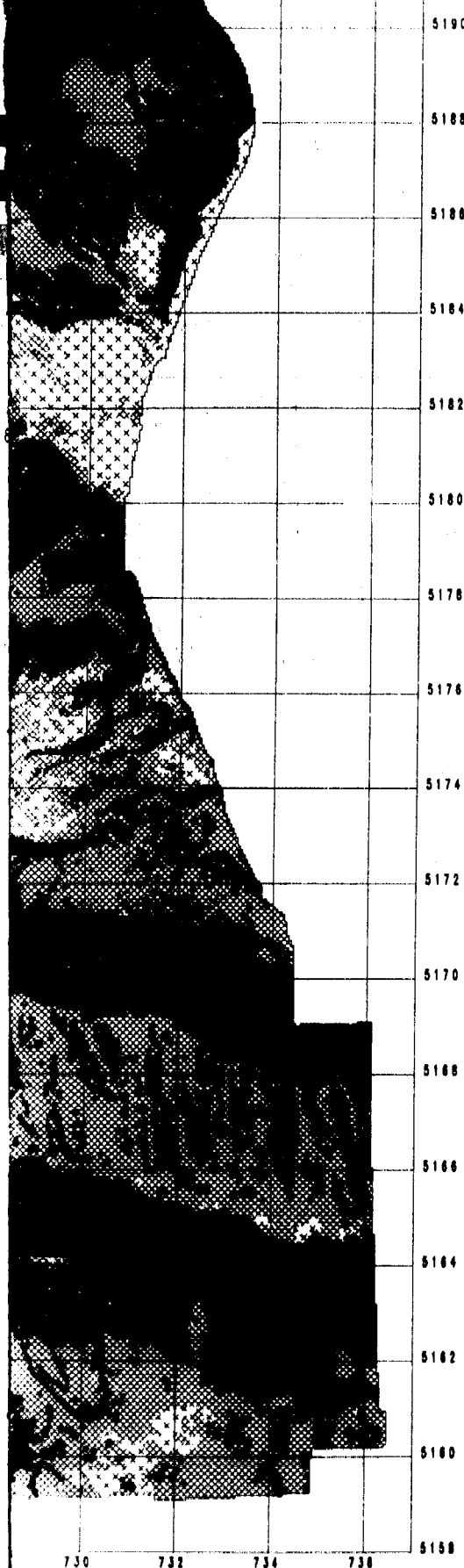
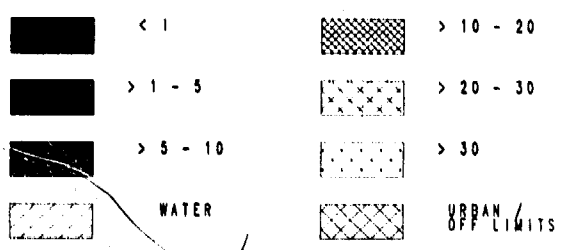


Plate 6. Speed map for 8X8 wheeled combat vehicle in the wet-wet slippery surface condition



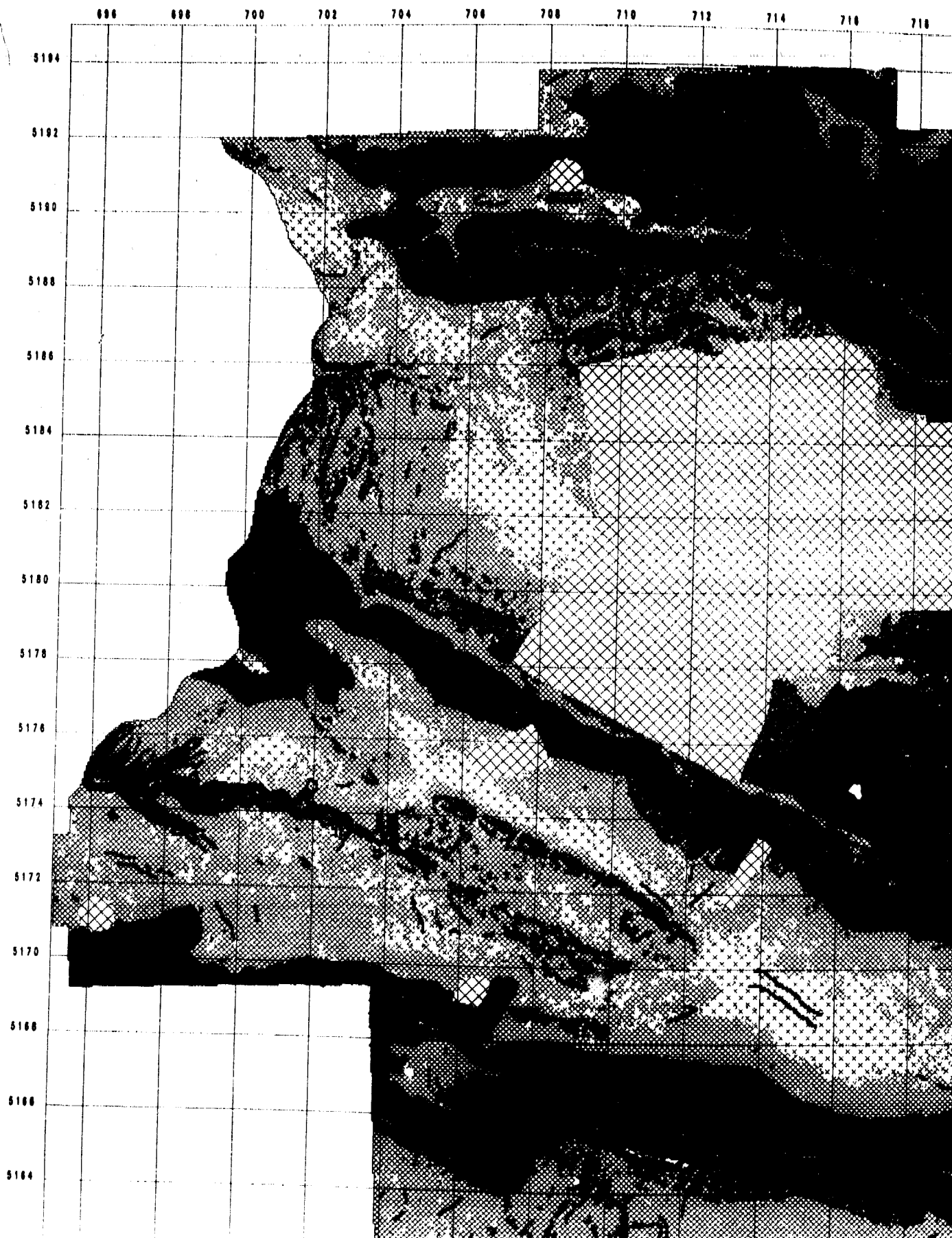
SPEED (MPH)
SCALE 1:100000



YAKIMA FIRING CENTER
SPEED MAP
8X8 WHEELED COMBAT VEHICLE
WET-WET SEASON
SLIPPERY CONDITION



t slippery surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

728 730 732 734 736











5104
5102
5100
5100
5100
5104
5102
5100
5178
5176
5174
5172
5170
5168
5166
5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)
SCALE 1:100000

	< 1		> 10 - 20
	> 1 - 5		> 20 - 30
	> 5 - 10		> 30
	WATER		URBAN / OFF LIMITS

YAKIMA FIRING CENTER
SPEED MAP
M60A3
DRY SEASON
NORMAL CONDITION

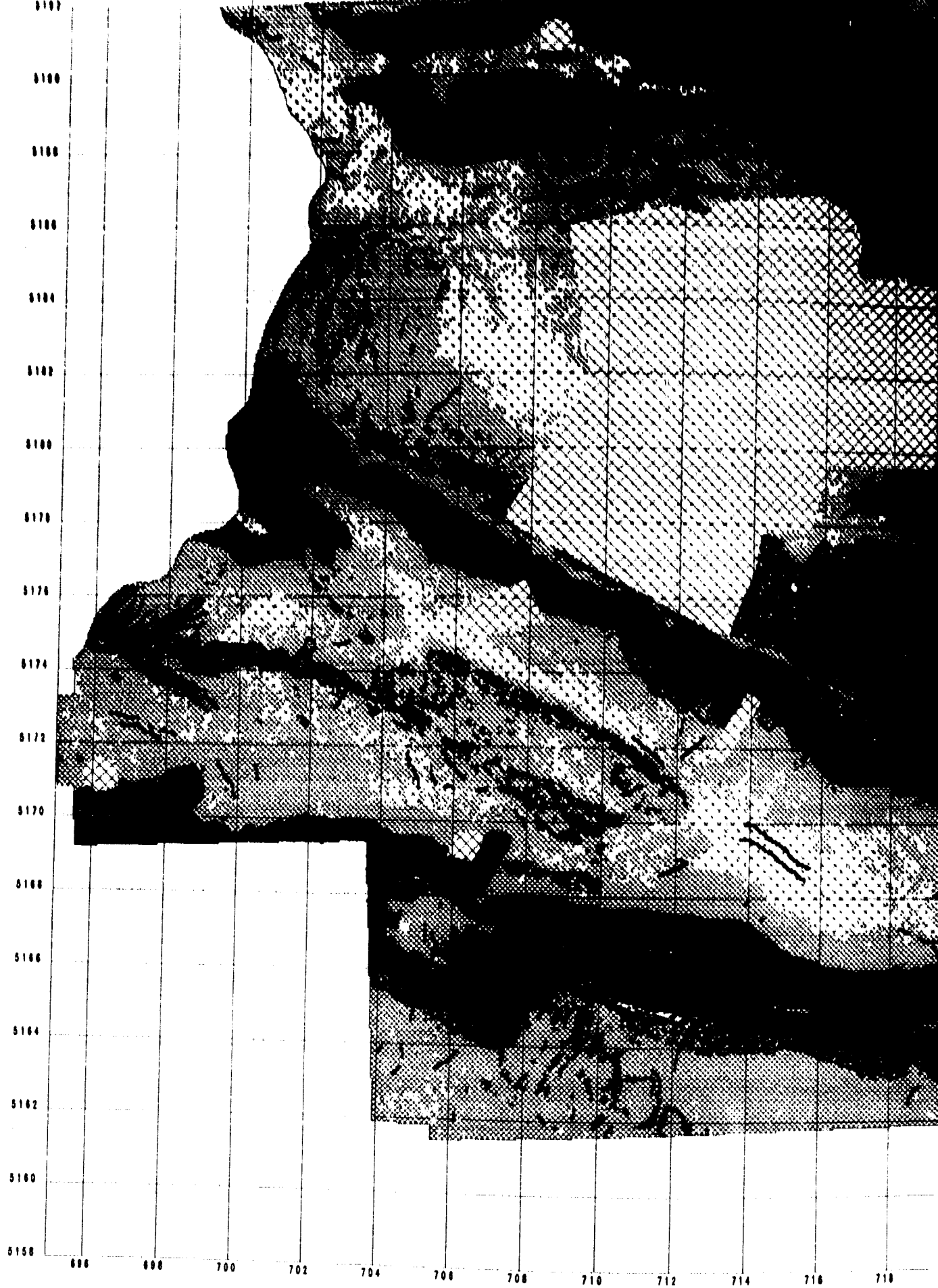


Plate 7. Speed map for

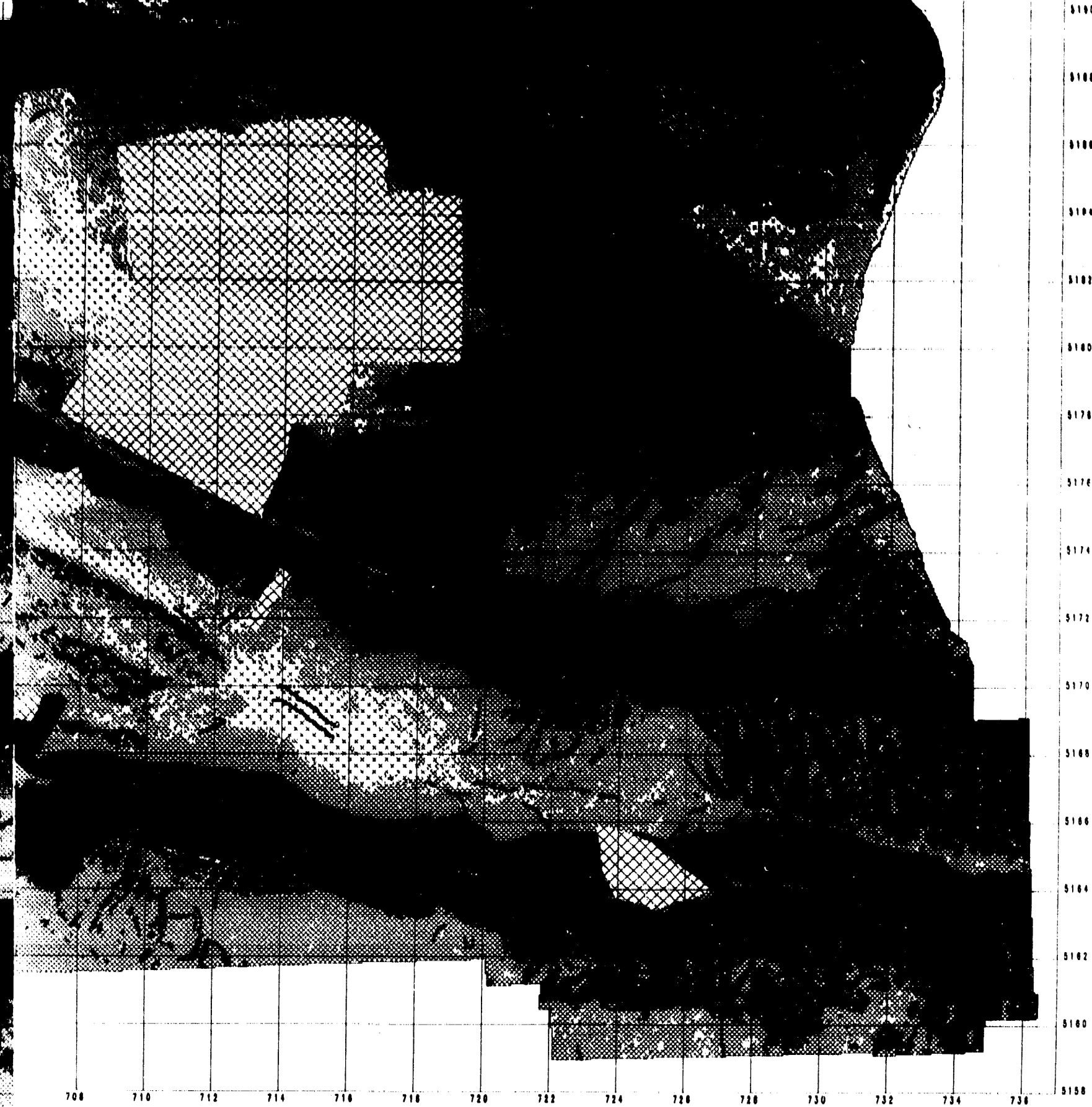
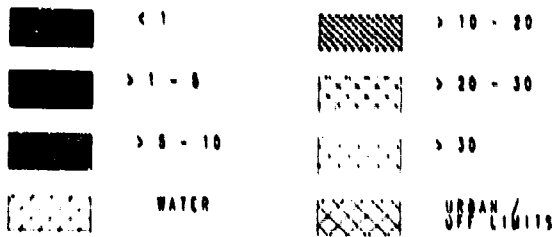
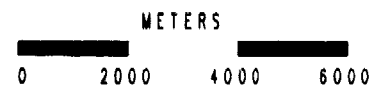
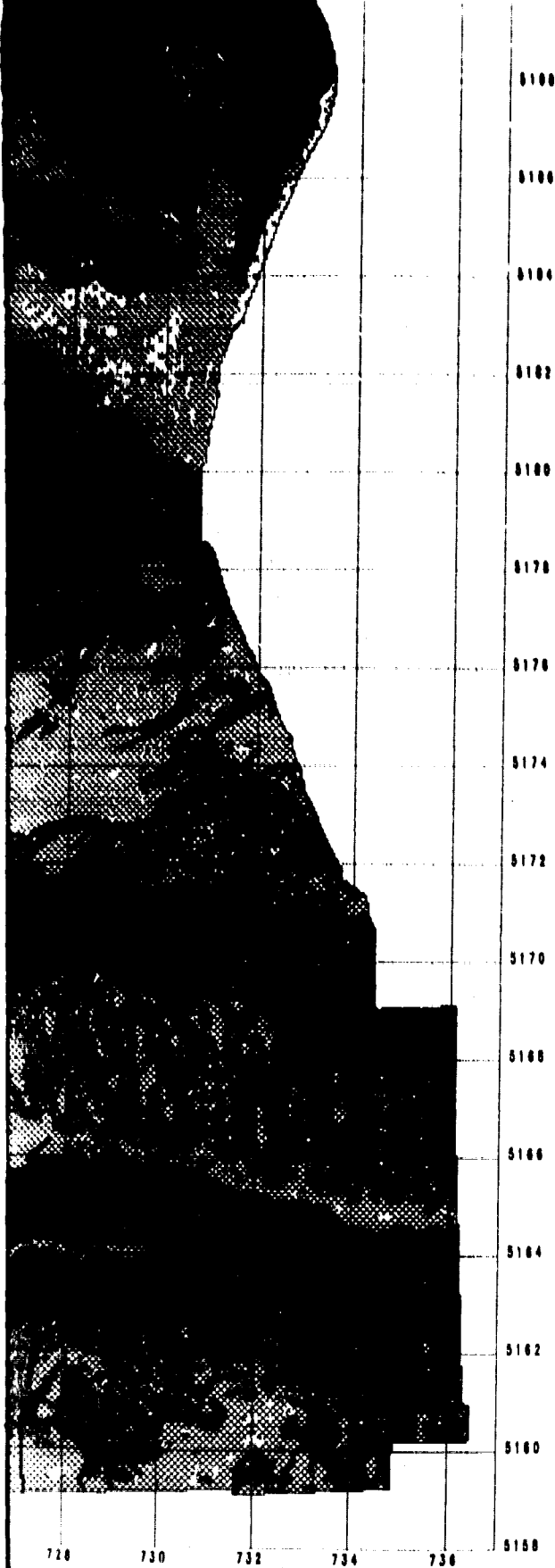


Plate 7. Speed map for M60A3 combat tank in the dry normal surface condition

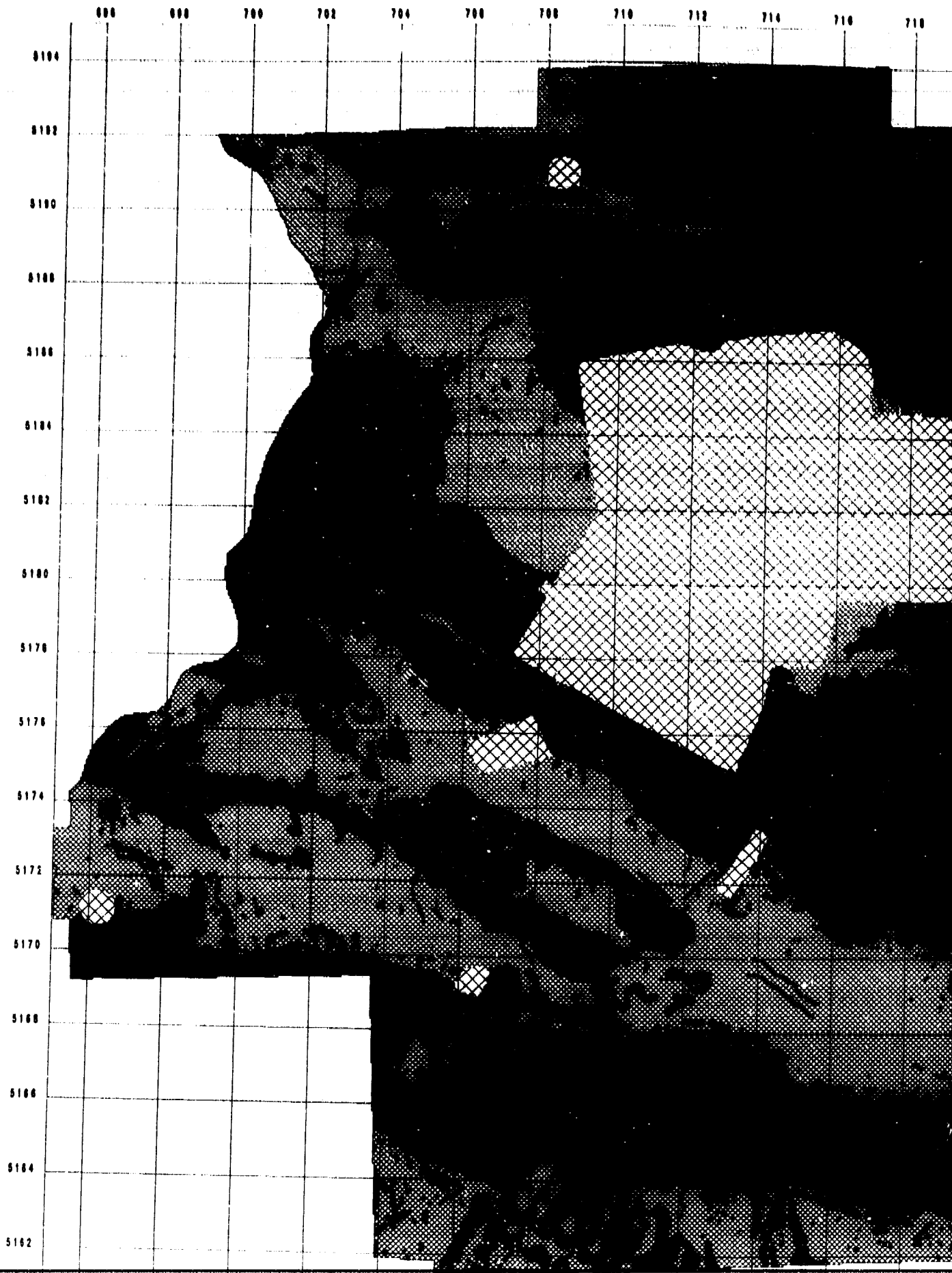
SPEED (MPH)
SCALE 1:100000



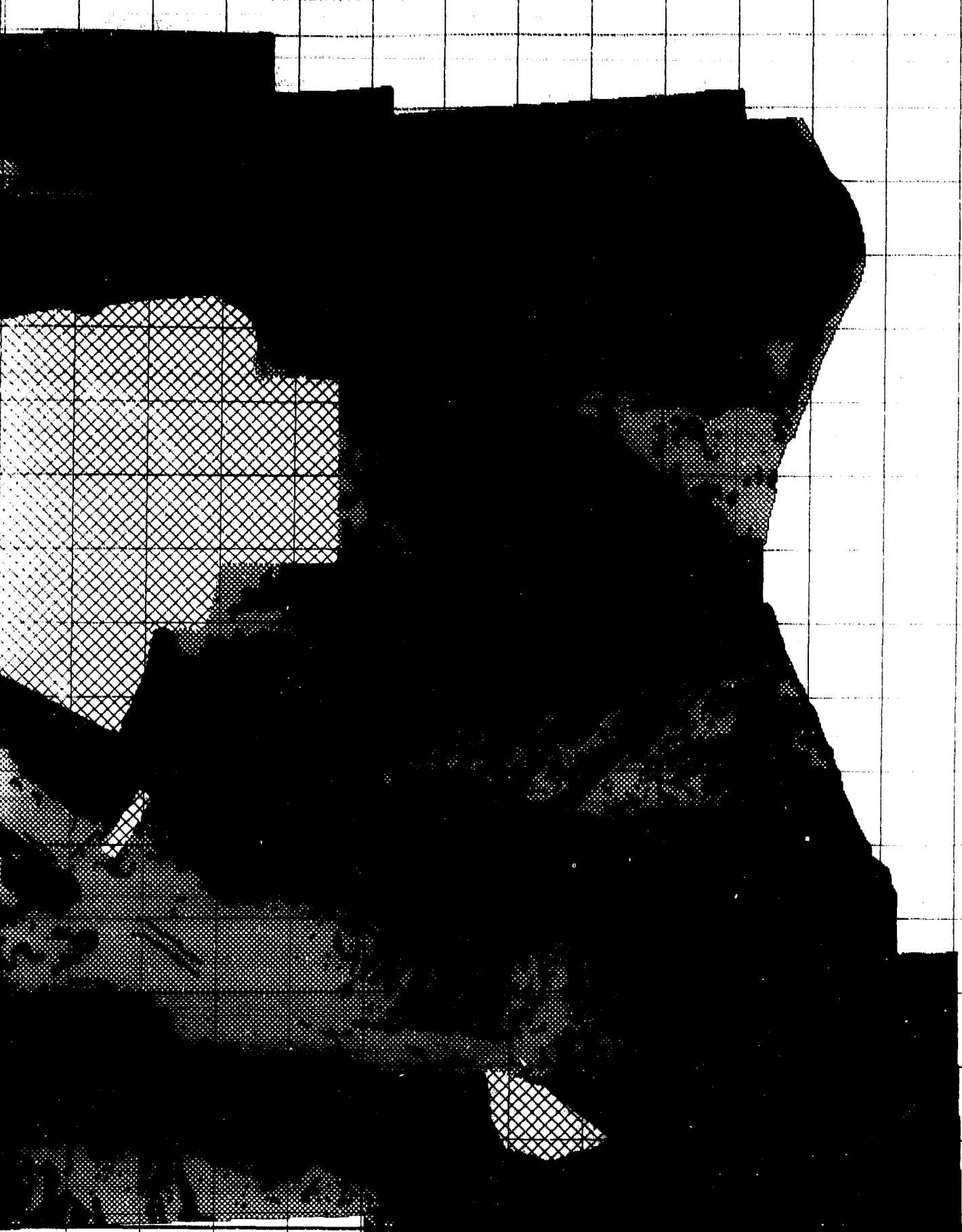
YAKIMA FIRING CENTER
SPEED MAP
M80A3
DRY SEASON
NORMAL CONDITION



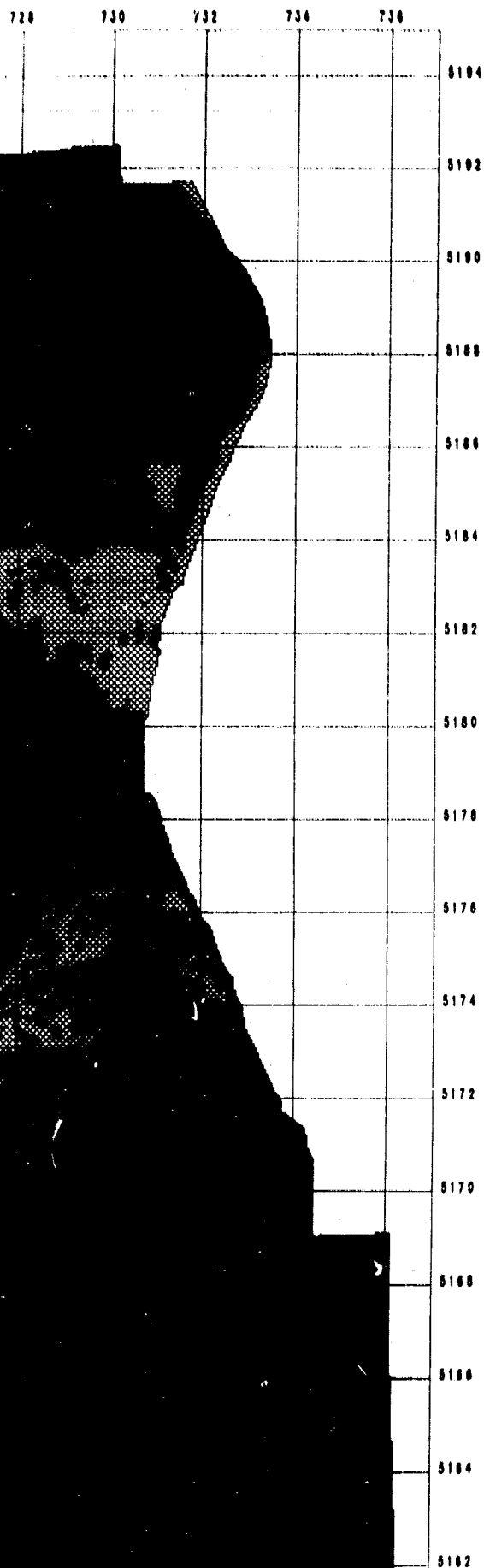
ry normal surface condition



712 714 716 718 720 722 724 726 728 730 732 734 736



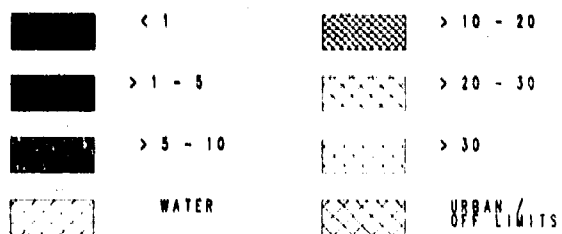
5184
5182
5180
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



YAKIMA FIRING CENTER

SPEED MAP

M60A3

WET-WET SEASON
SLIPPERY CONDITION

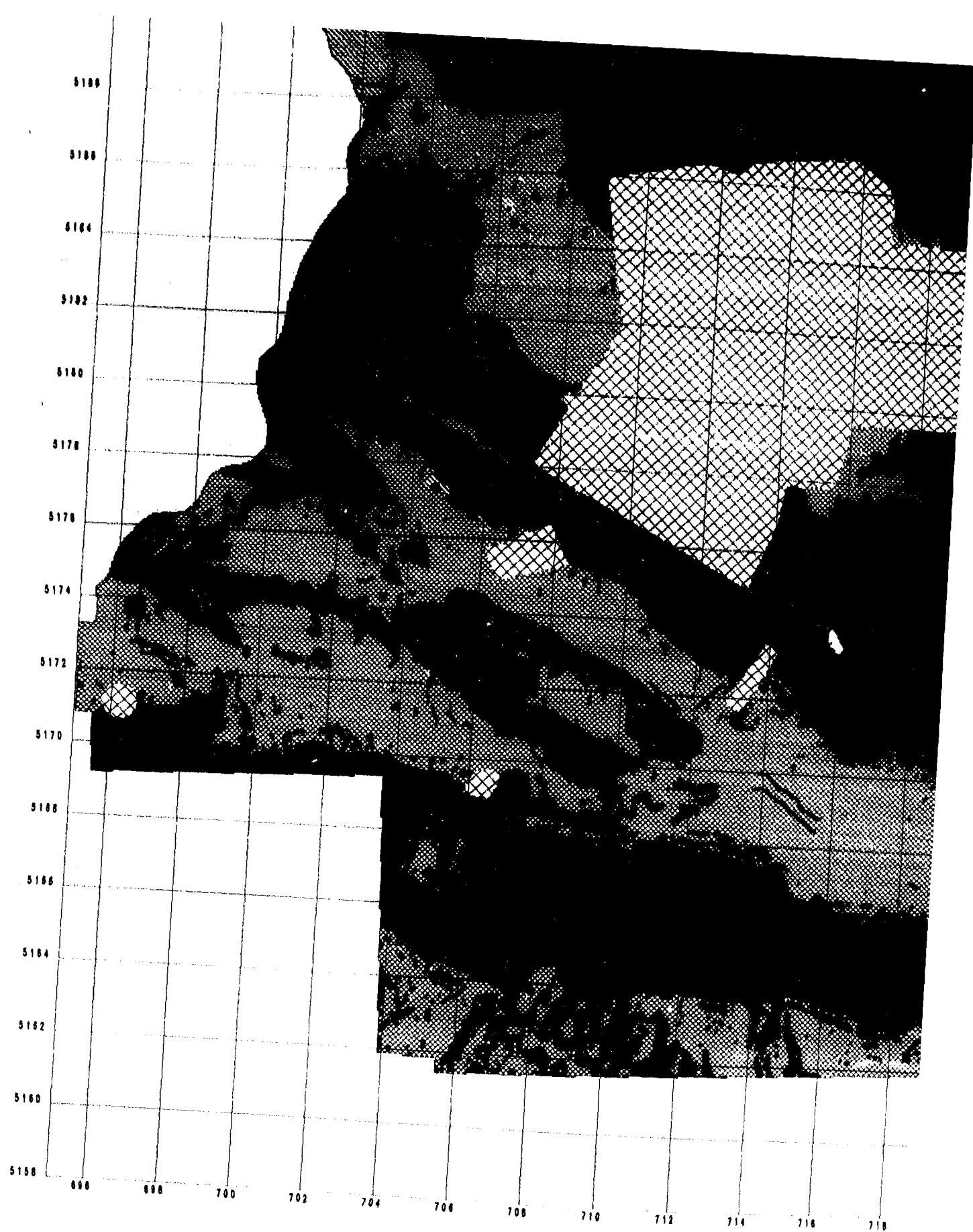
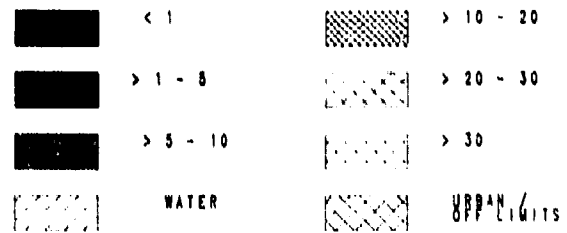


Plate 8. Speed map fo



Plate 8. Speed map for M60A3 combat tank in the wet-wet slippery surface condition

SCALE 1:100000



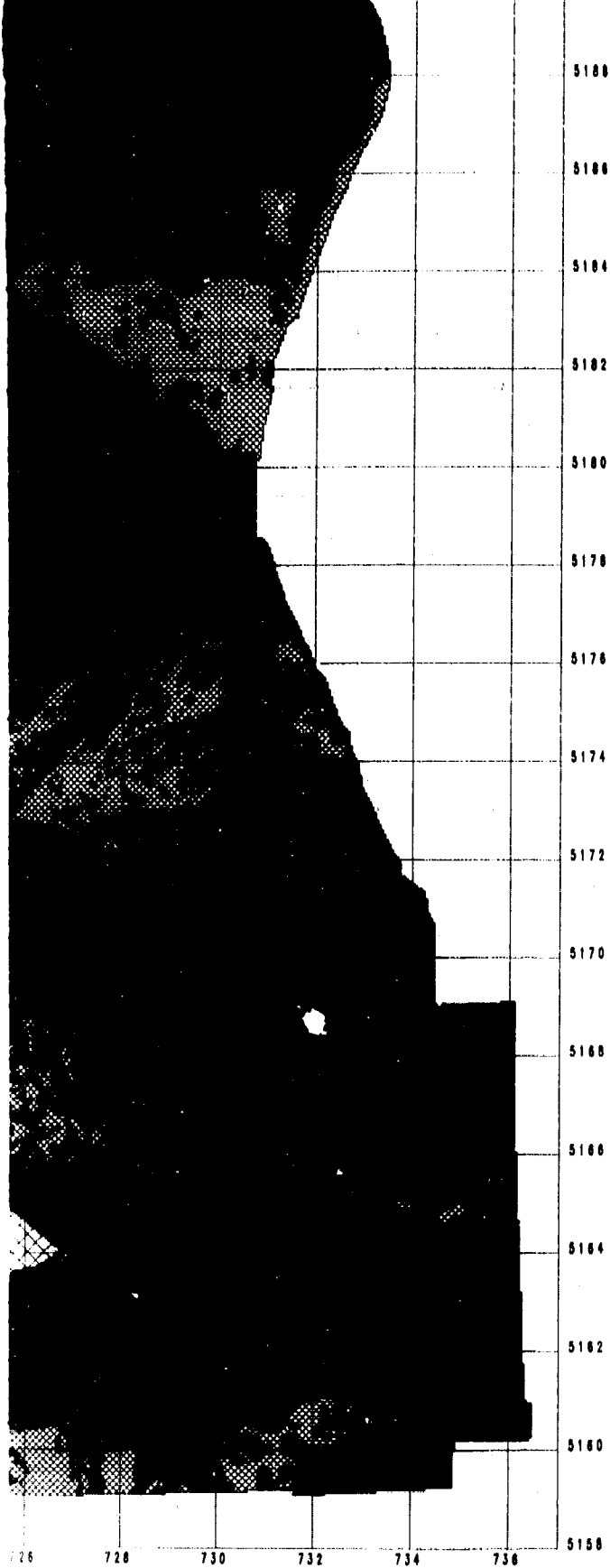
YAKIMA FIRING CENTER

SPEED MAP

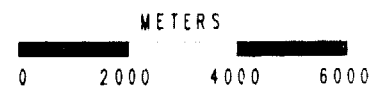
M60A3

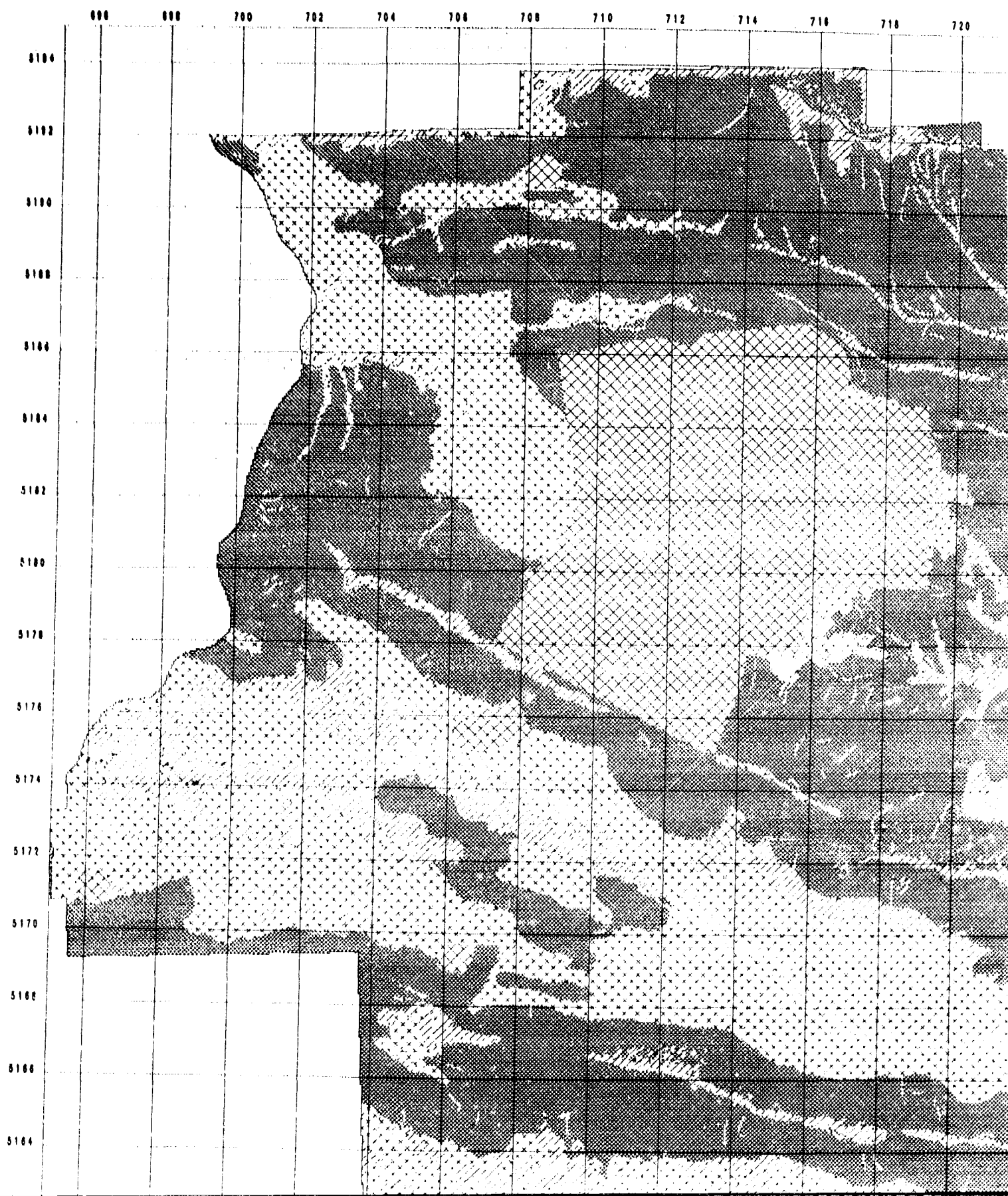
WET-WET SEASON

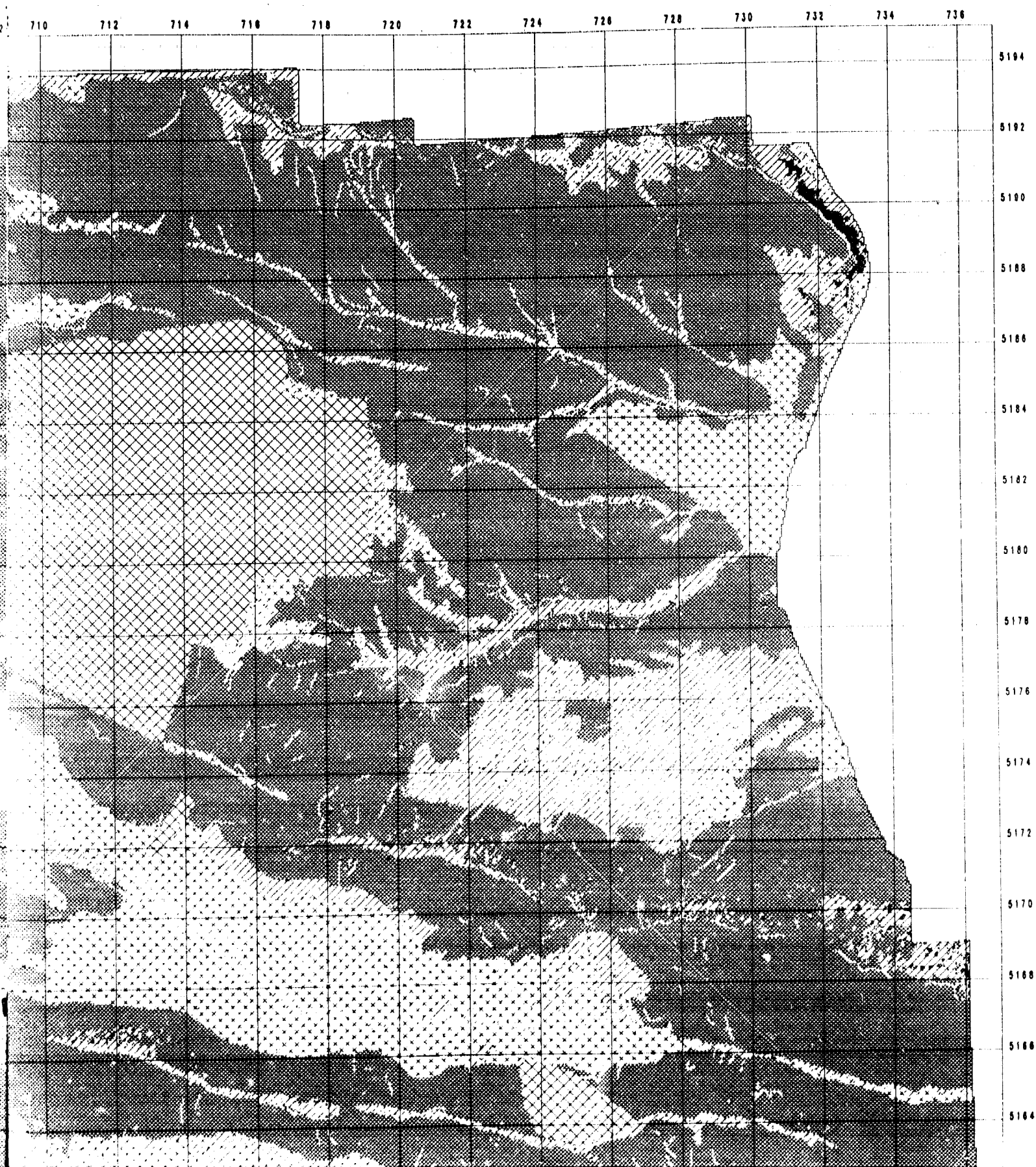
SLIPPERY CONDITION



wet-wet slippery surface condition







728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



OBSTACLE



VISIBILITY



VEGETATION



ACCELERATION/
DECCELERATION



MANEUVER



RIDE



CONE INDEX



TRACTION



RESISTANCE



SOIL/SLOPE



URBAN



COMBINATION OF ANY
TWO OR MORE FACTORS

YAKIMA FIRING CENTER

HMMVV

DRY SEASON

NORMAL CONDITION

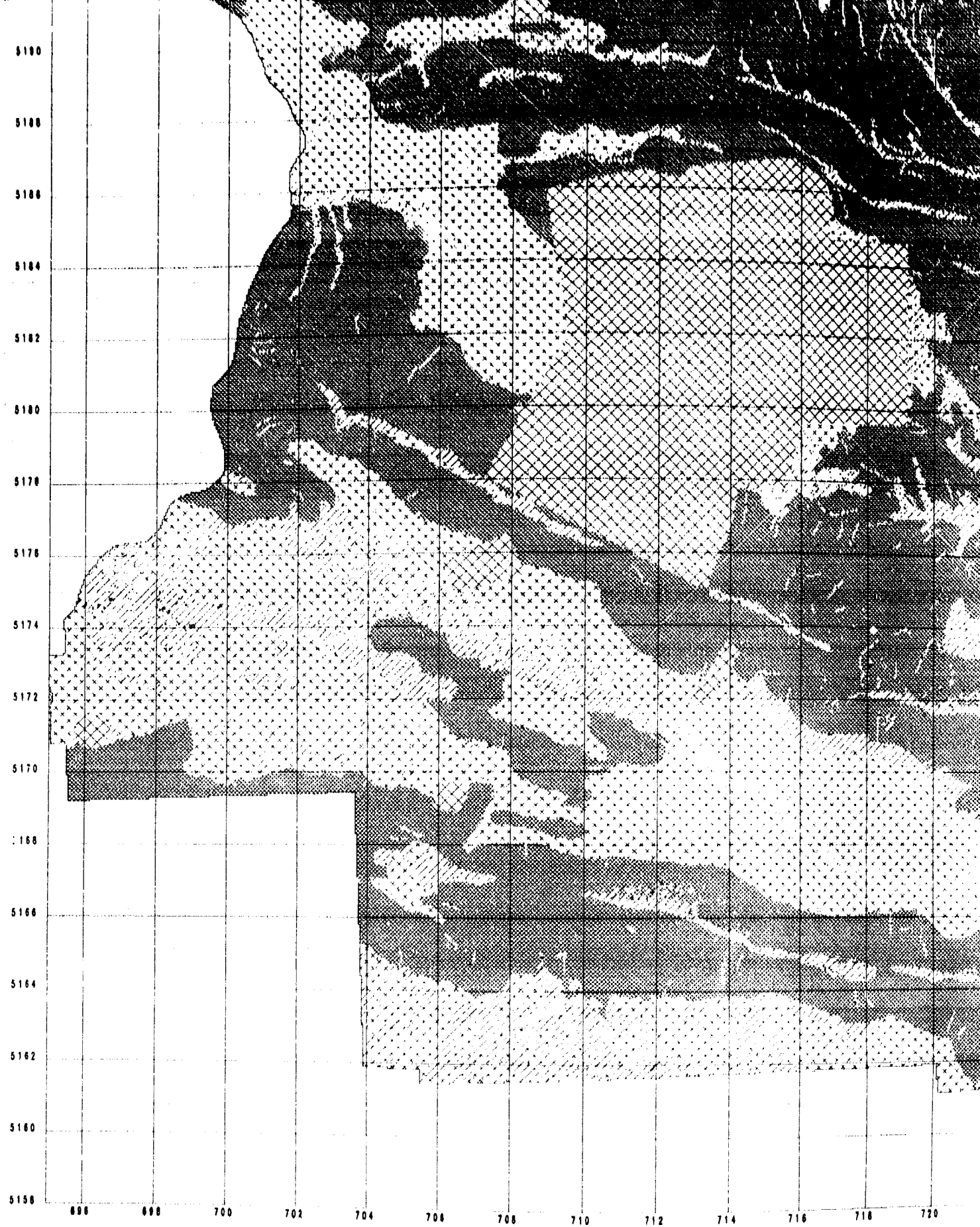


Plate 9. Speed limiting reason map for M998 (

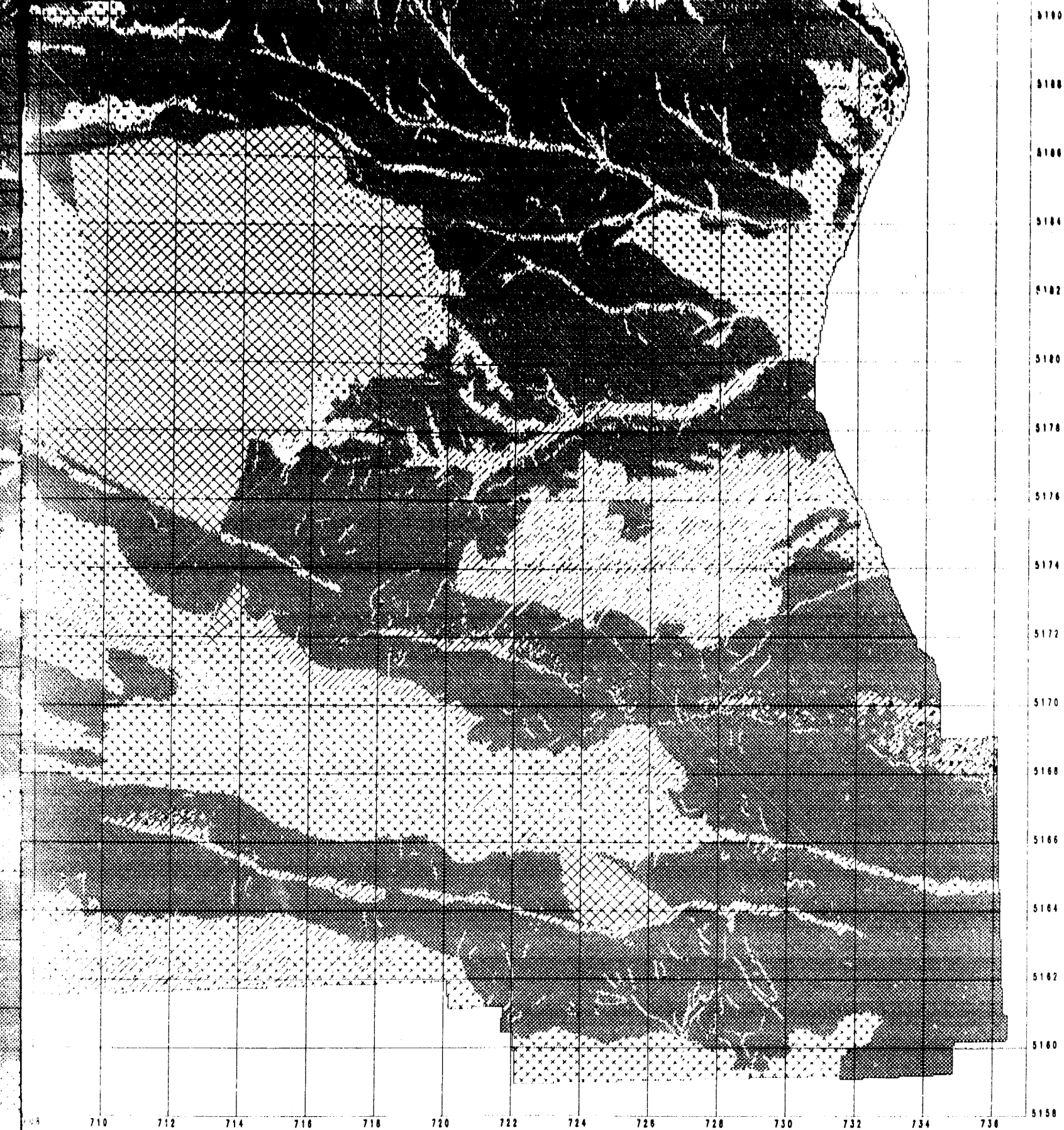
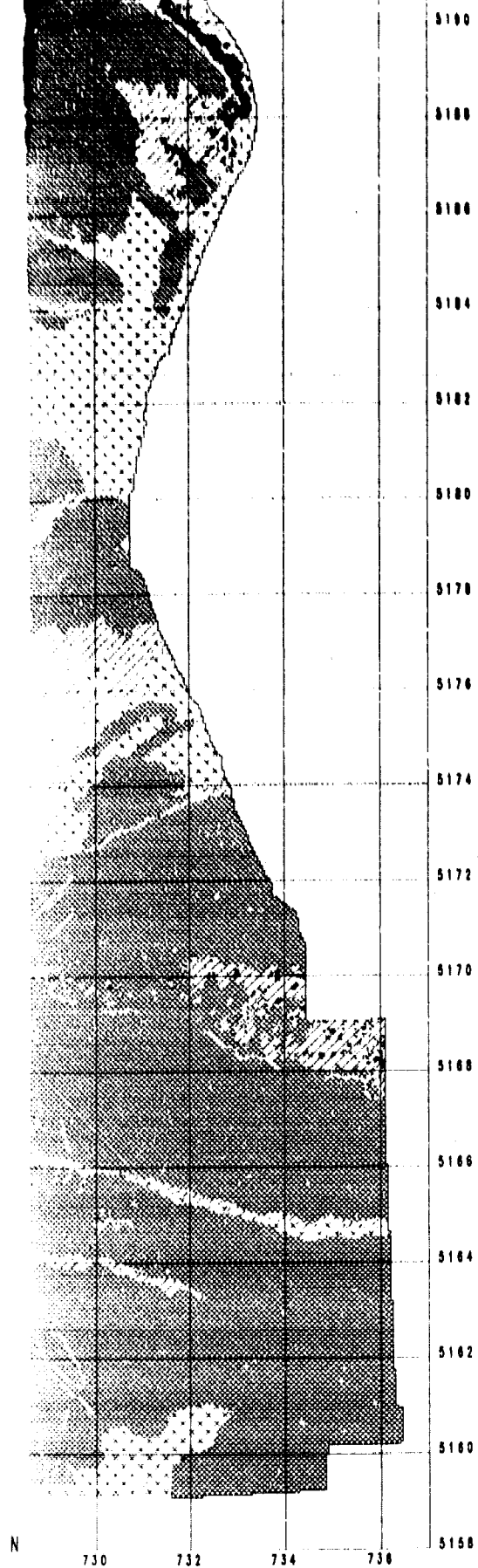


Plate 9. Speed limiting reason map for M998 (HMMWV) wheeled vehicle in the dry normal surface condition



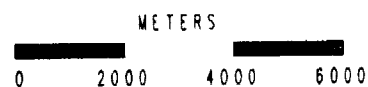
SPEED LIMITING REASON

SCALE 1:100000

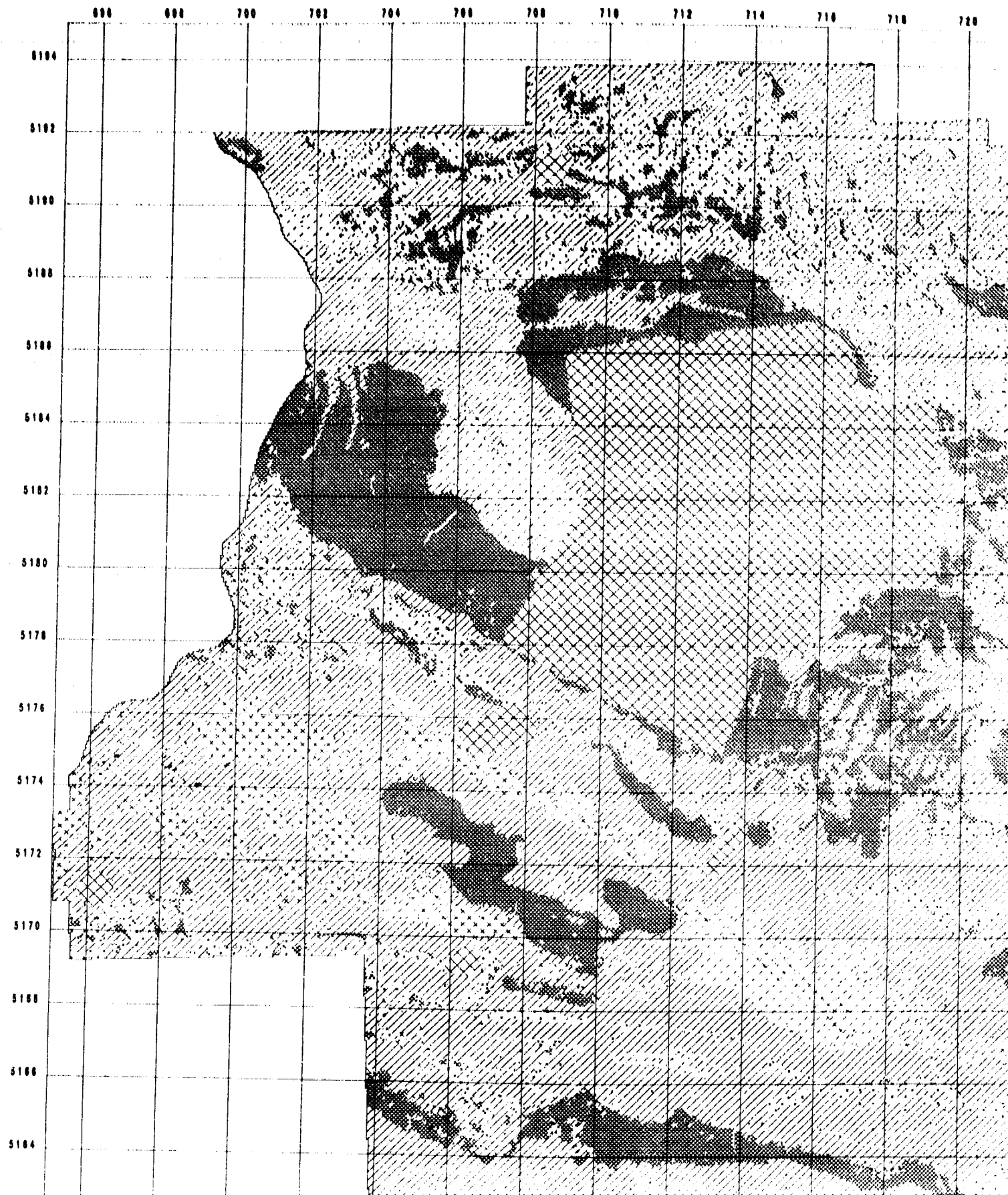
	OBSTACLE		CONC INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

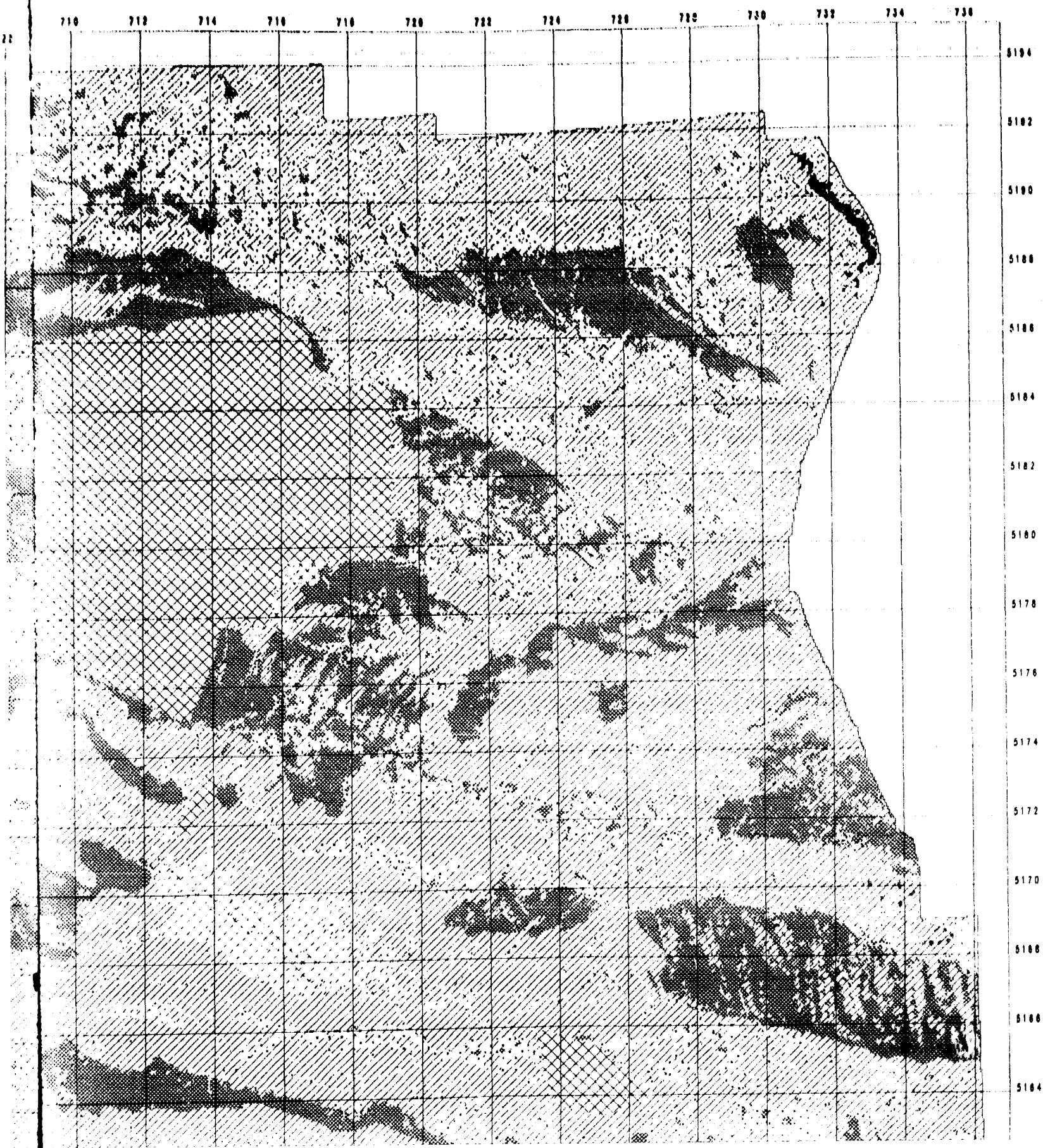
YAKIMA FIRING CENTER

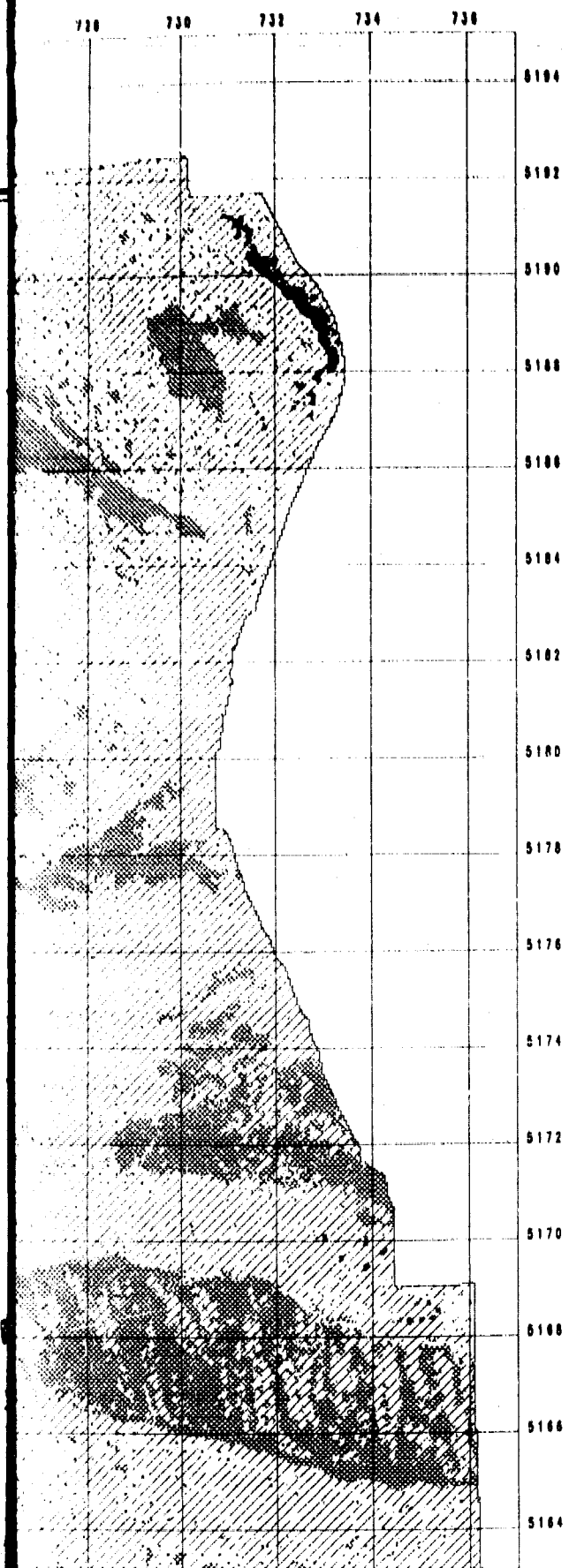
HMMWV
 DRY SEASON
 NORMAL CONDITION



dry normal surface condition







U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER
8X8 WHEELED COMBAT VEHICLE
DRY SEASON
NORMAL CONDITION

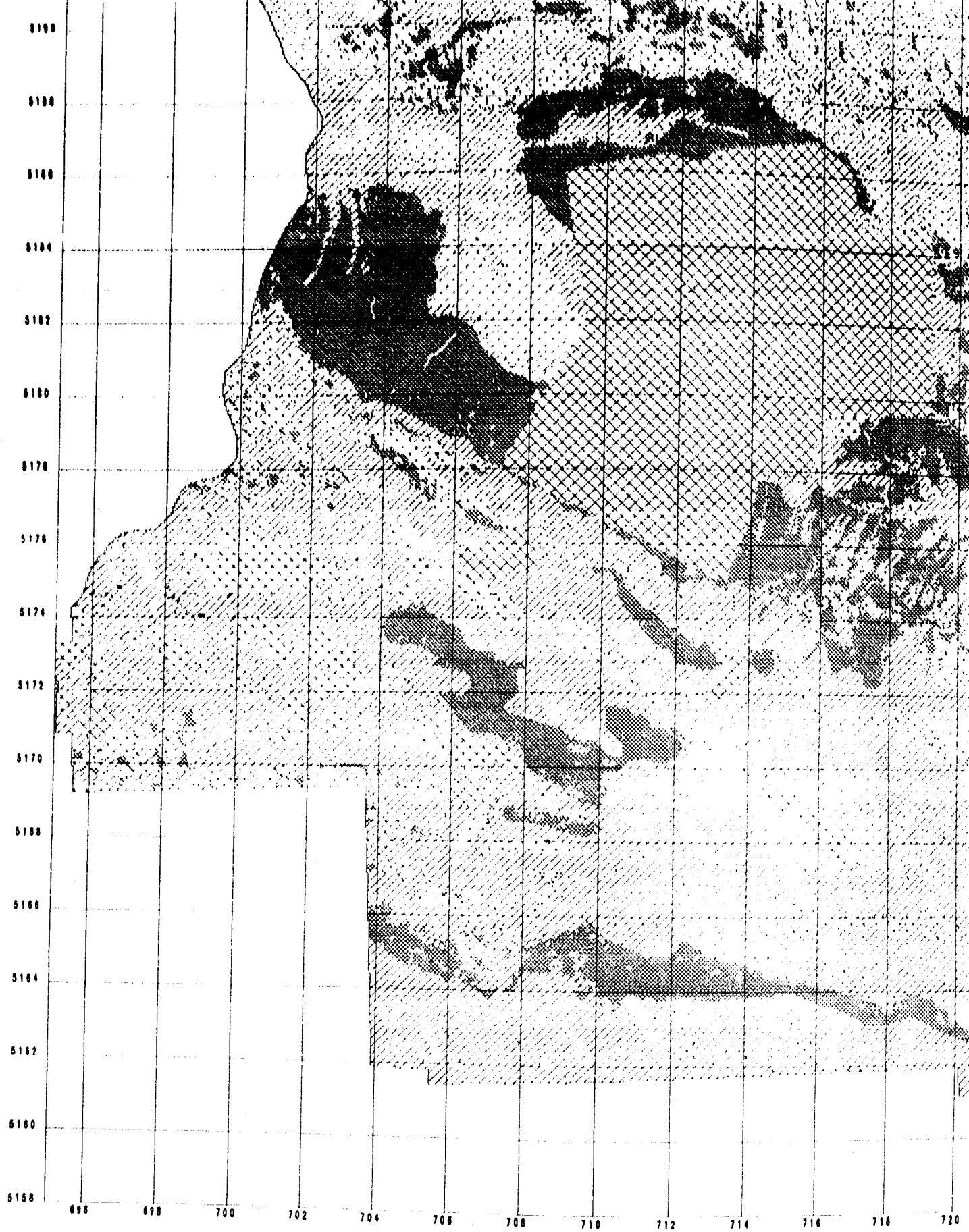


Plate 10. Speed limiting reason map

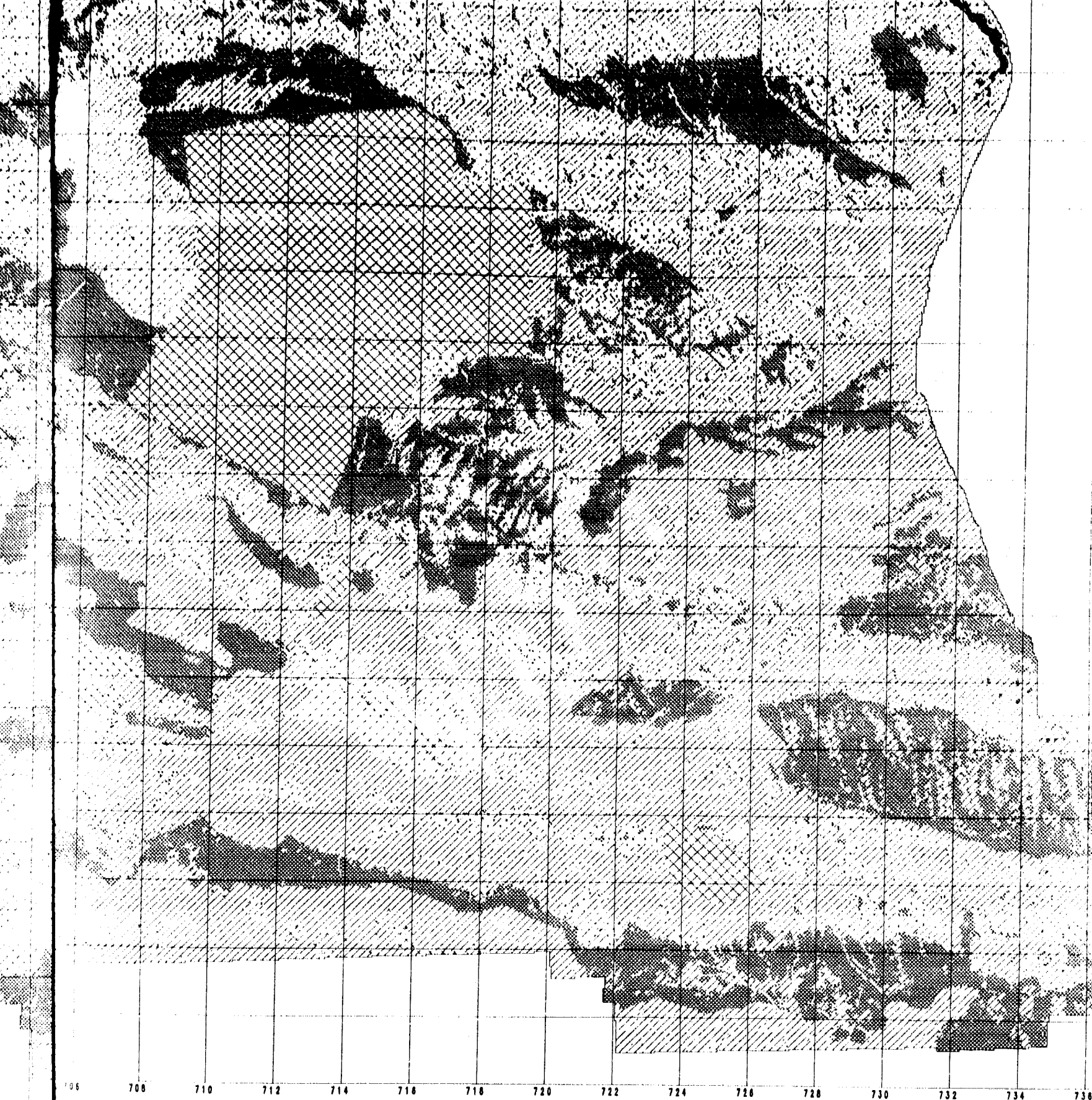


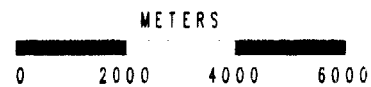
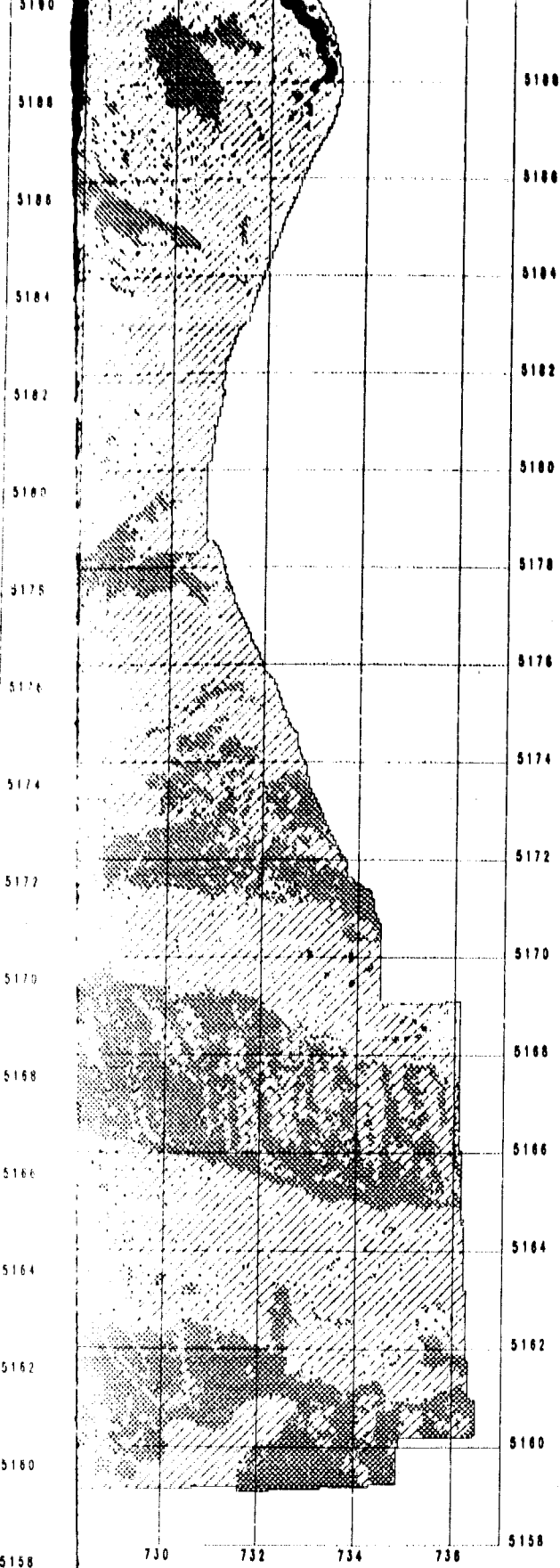
Plate 10. Speed limiting reason map for 8X8 wheeled combat vehicle in the dry normal surface condit

SPEED LIMITING REASON

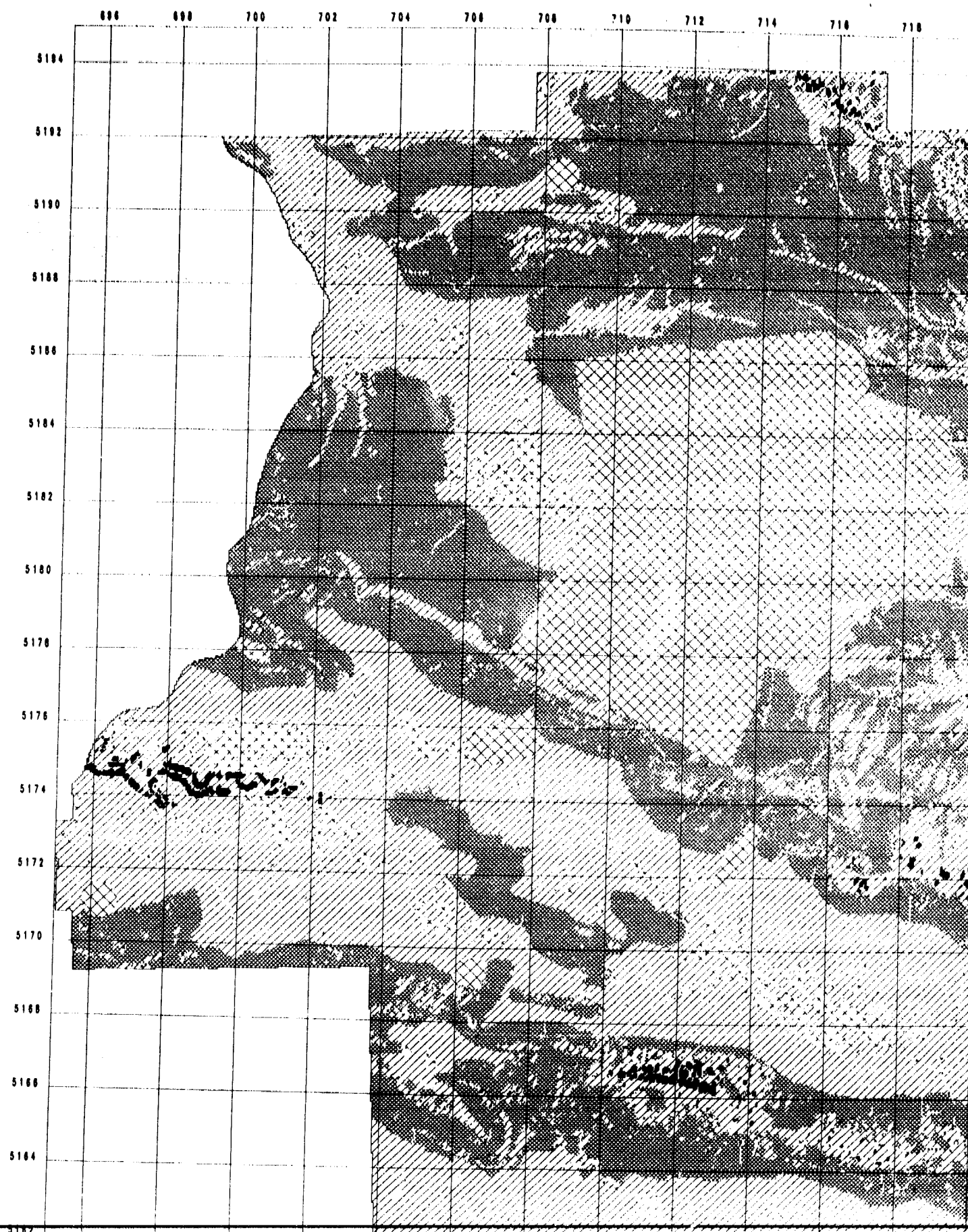
SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER
8X8 WHEELED COMBAT VEHICLE
DRY SEASON
NORMAL CONDITION



in the dry normal surface condition



708 710 712 714 716 718 720 722 724 726 728 730 732 734 736

74

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

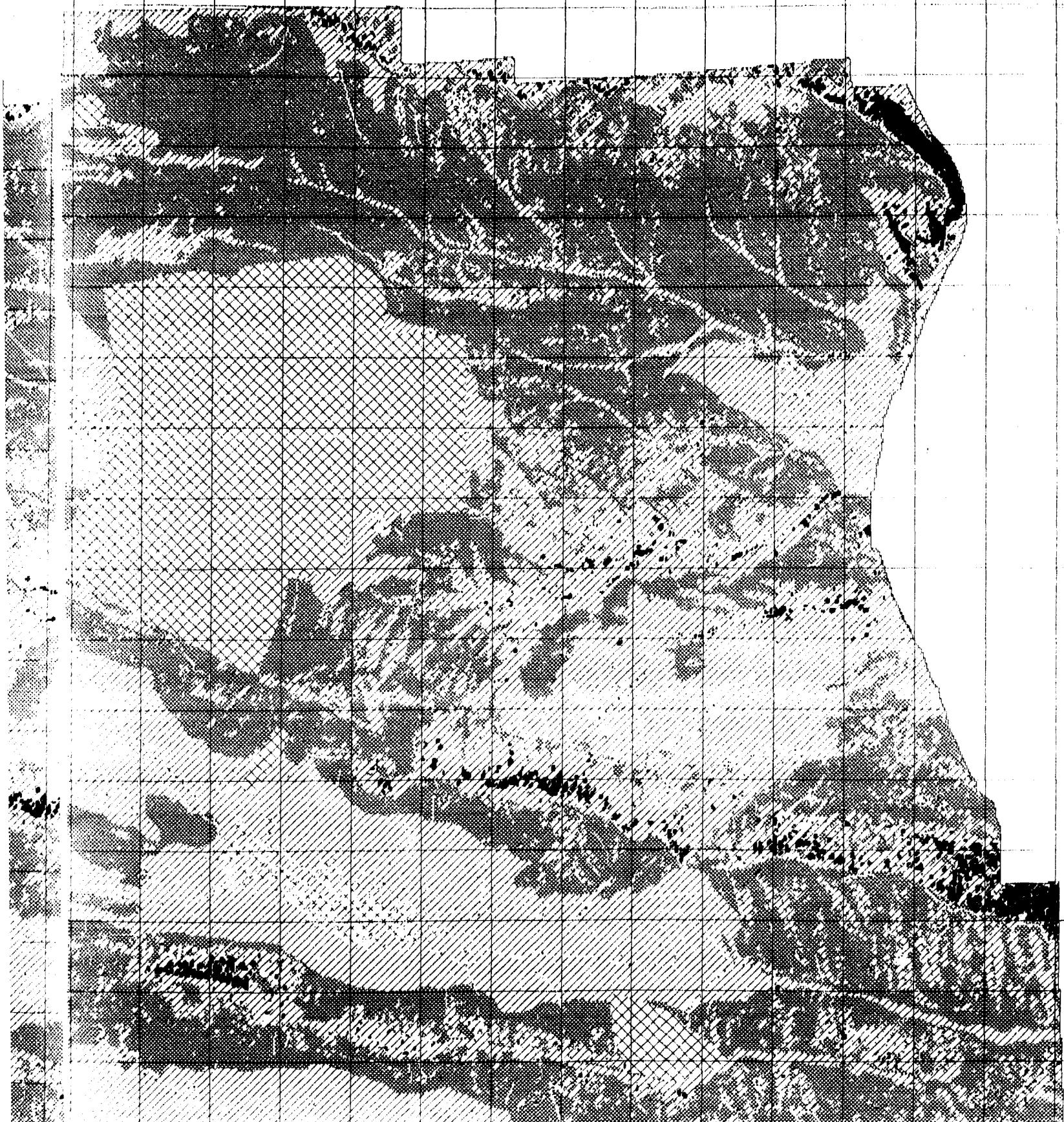
5172

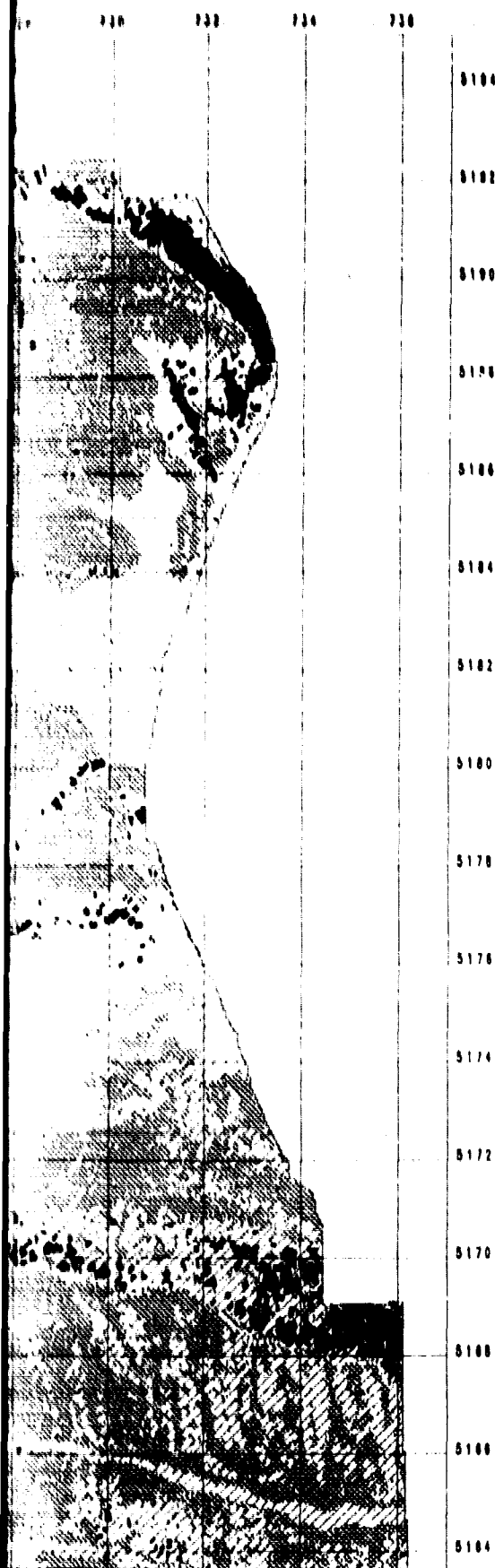
5170

5168

5166

5164





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECCELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER

M60A3
DRY SEASON
NORMAL CONDITION

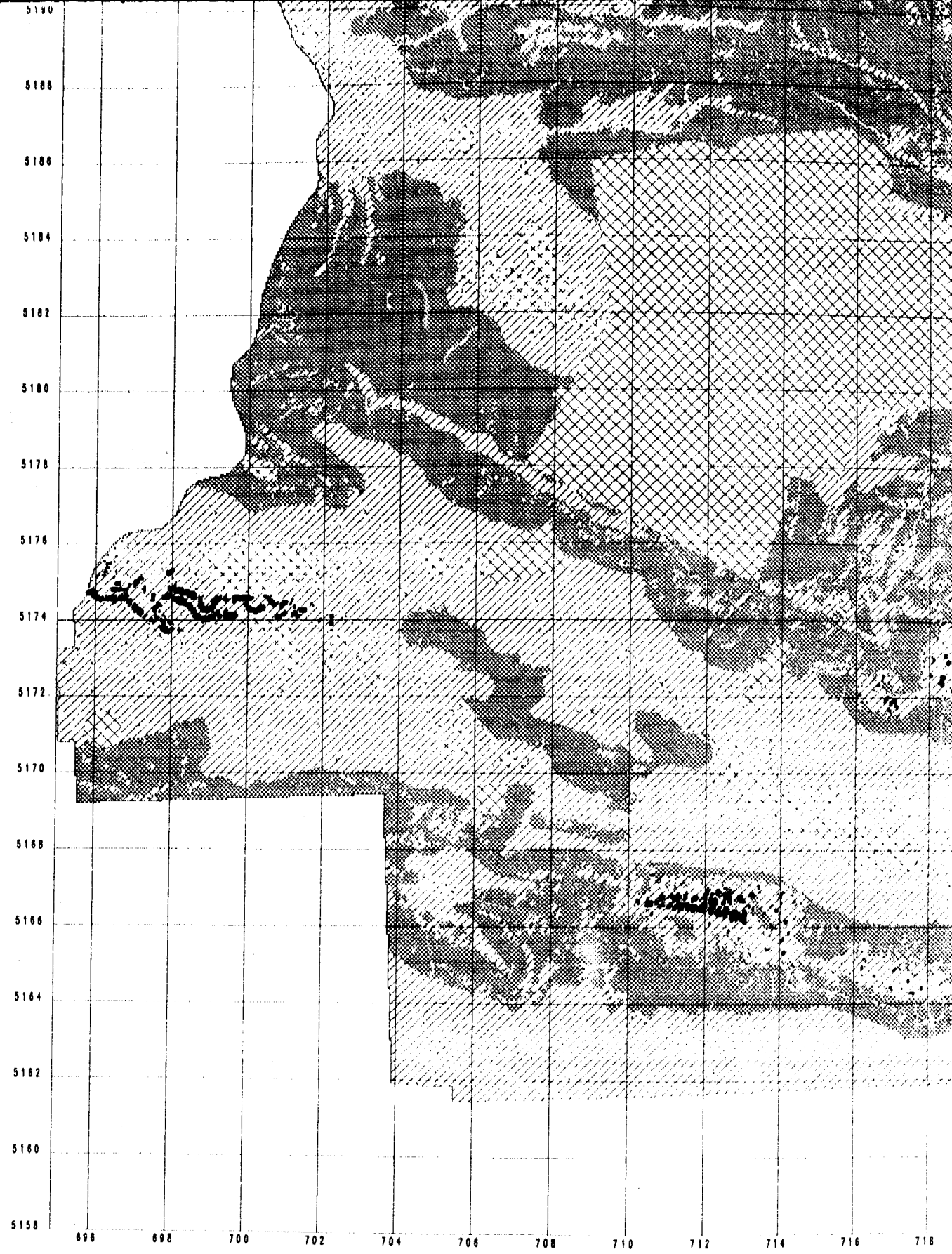


Plate 11. Speed limiting rea

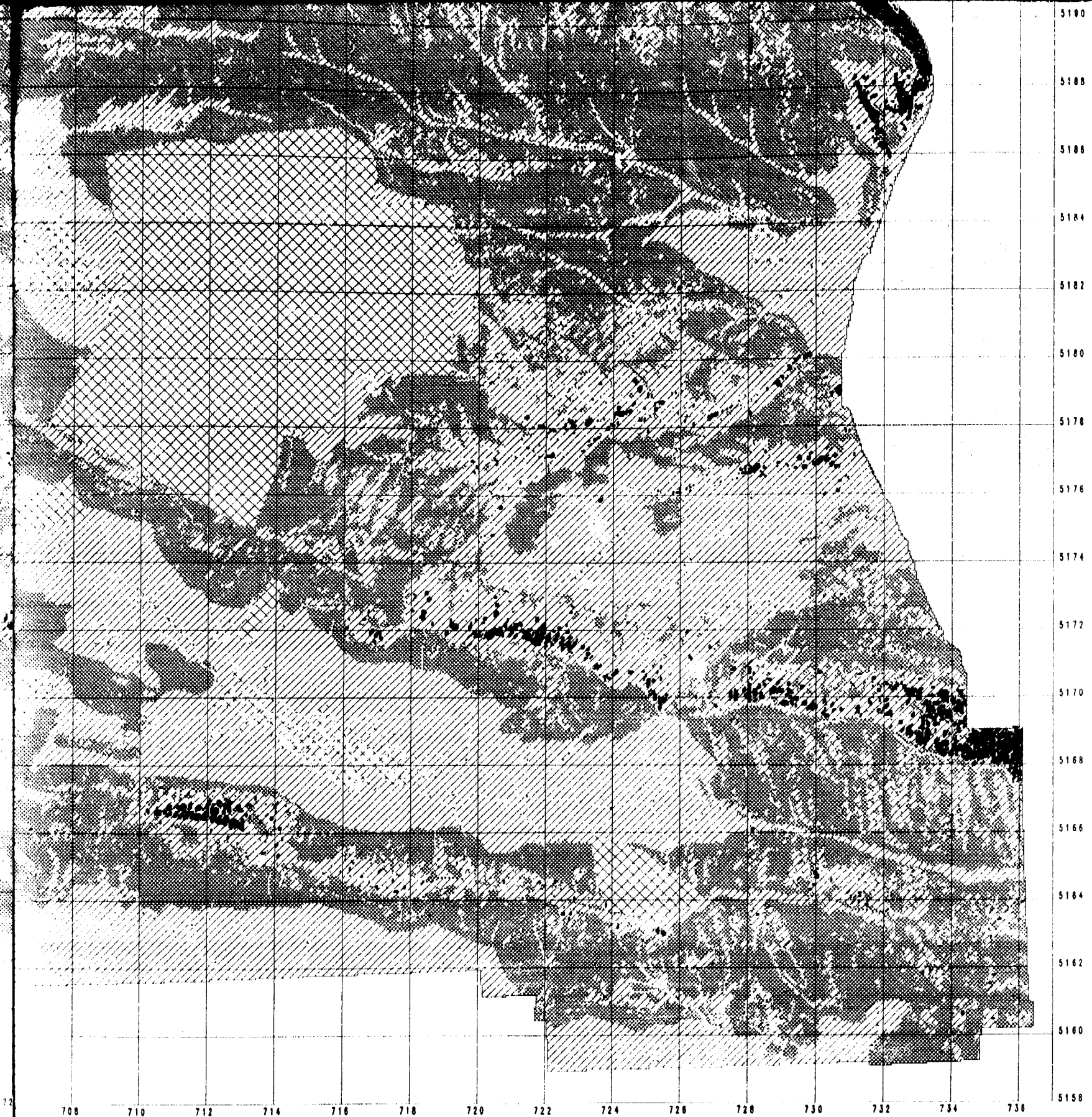














Plate 11. Speed limiting reason map for M60A3 combat tank in the dry normal surface condition

SPEED LIMITING REASON

SCALE 1:100000

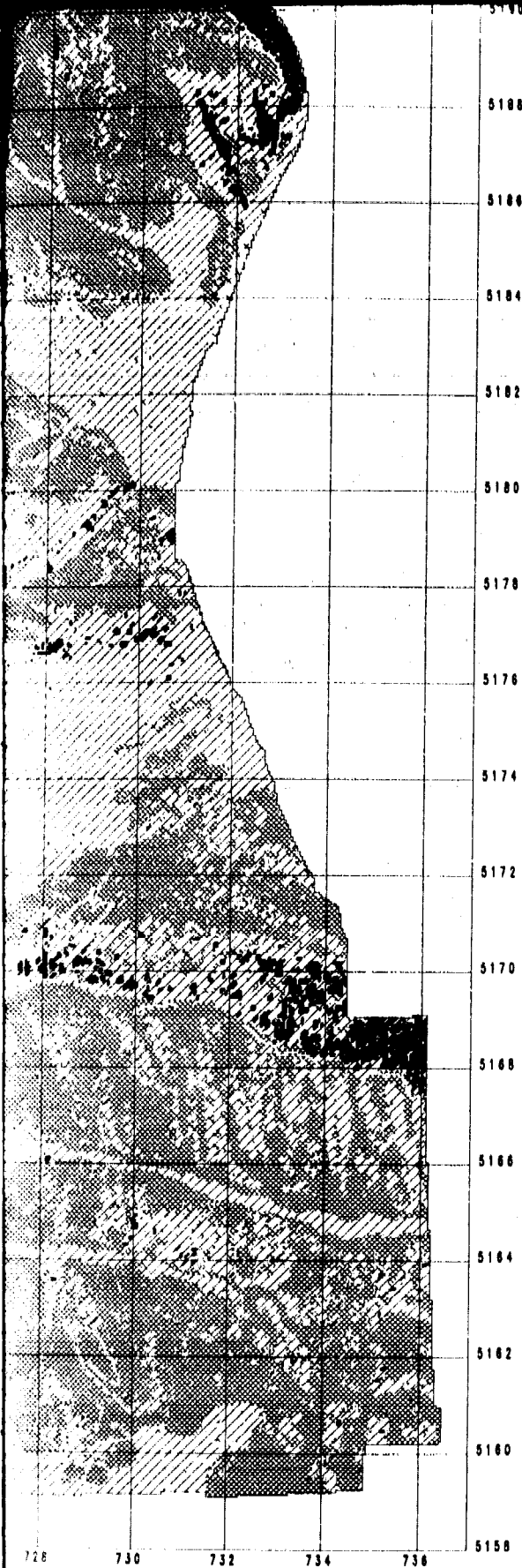
	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER

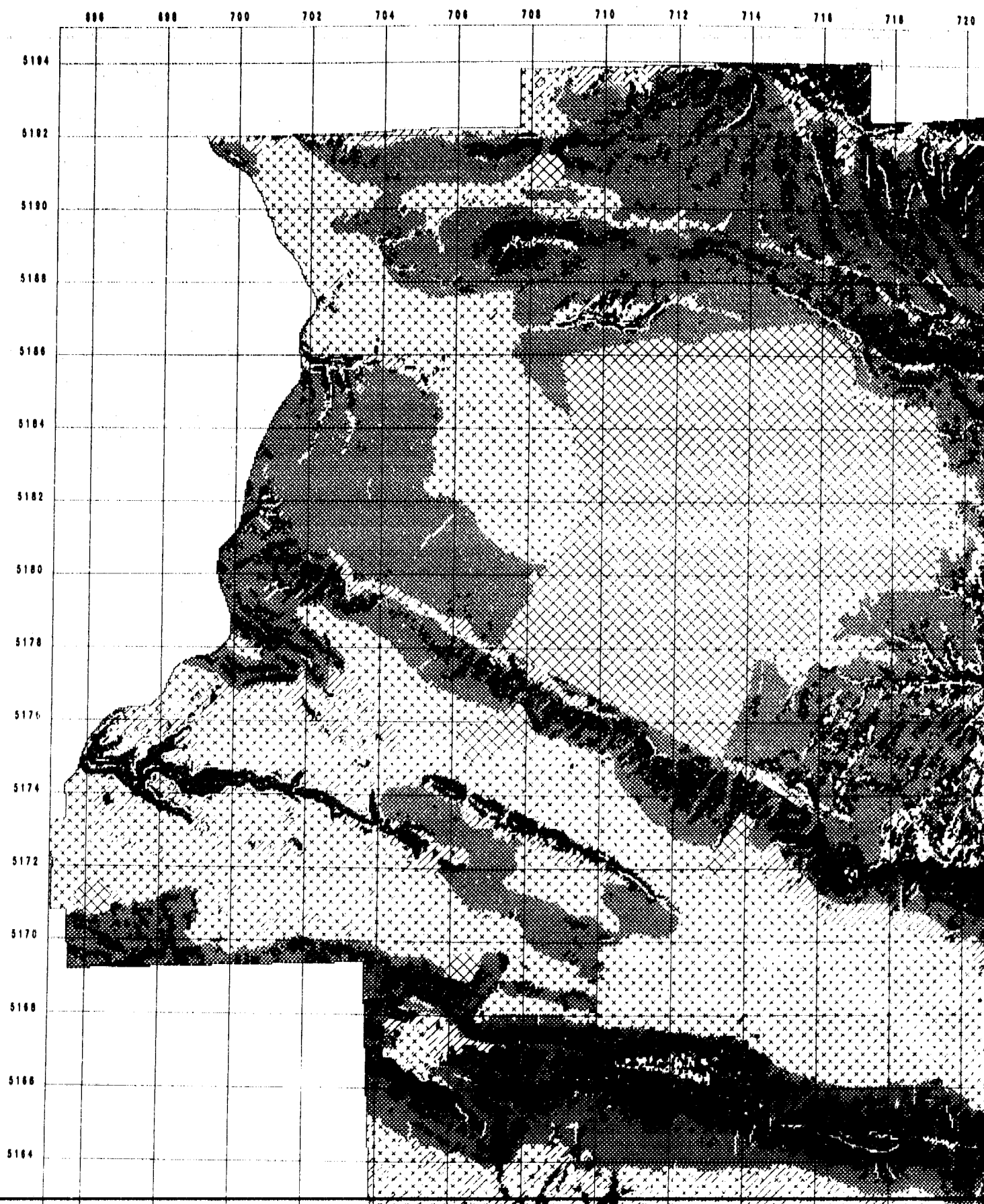
M60A3

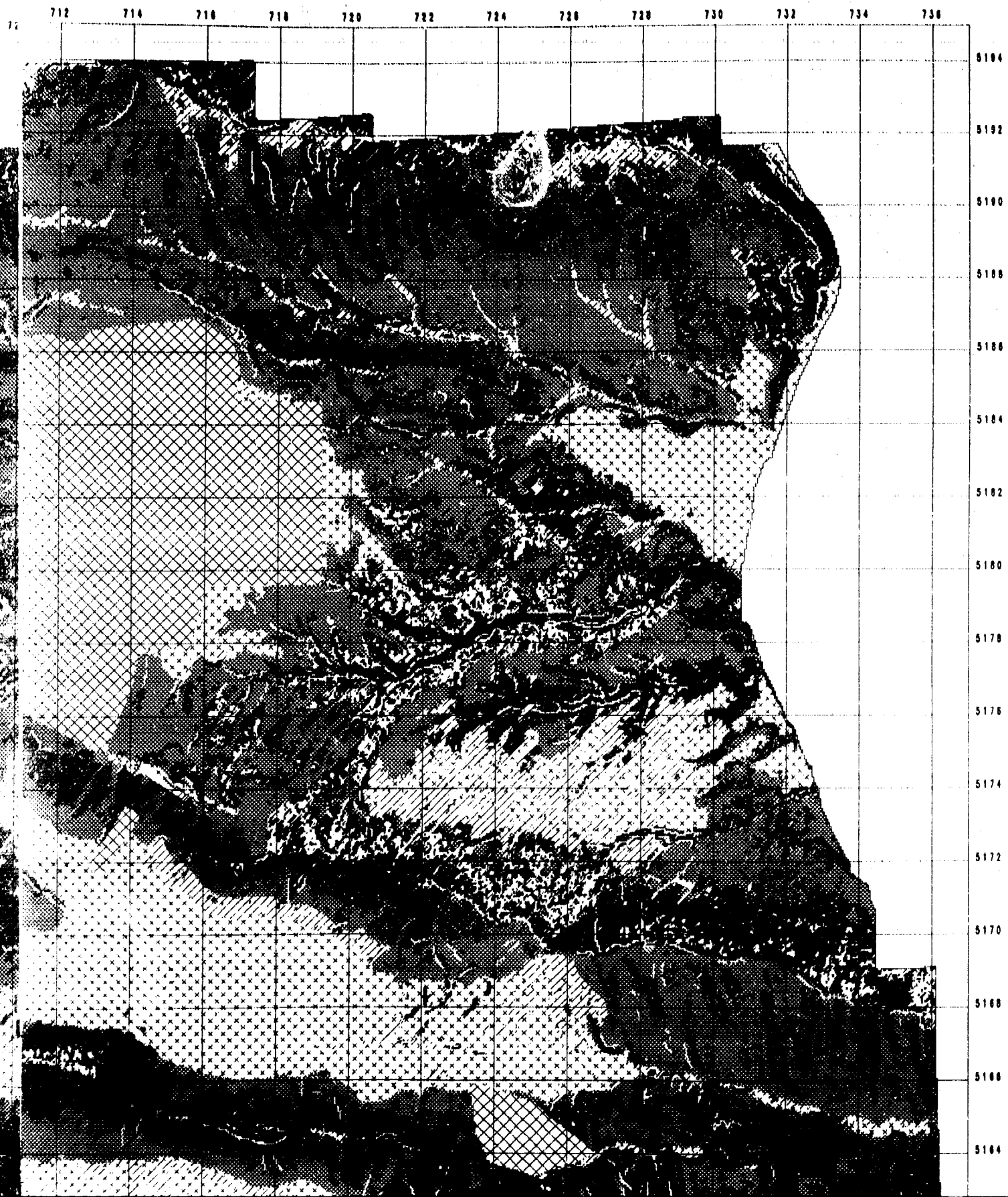
DRY SEASON

NORMAL CONDITION



the dry normal surface condition





730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECCELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER

HMMVV

WET-WET SEASON

SLIPPERY CONDITION

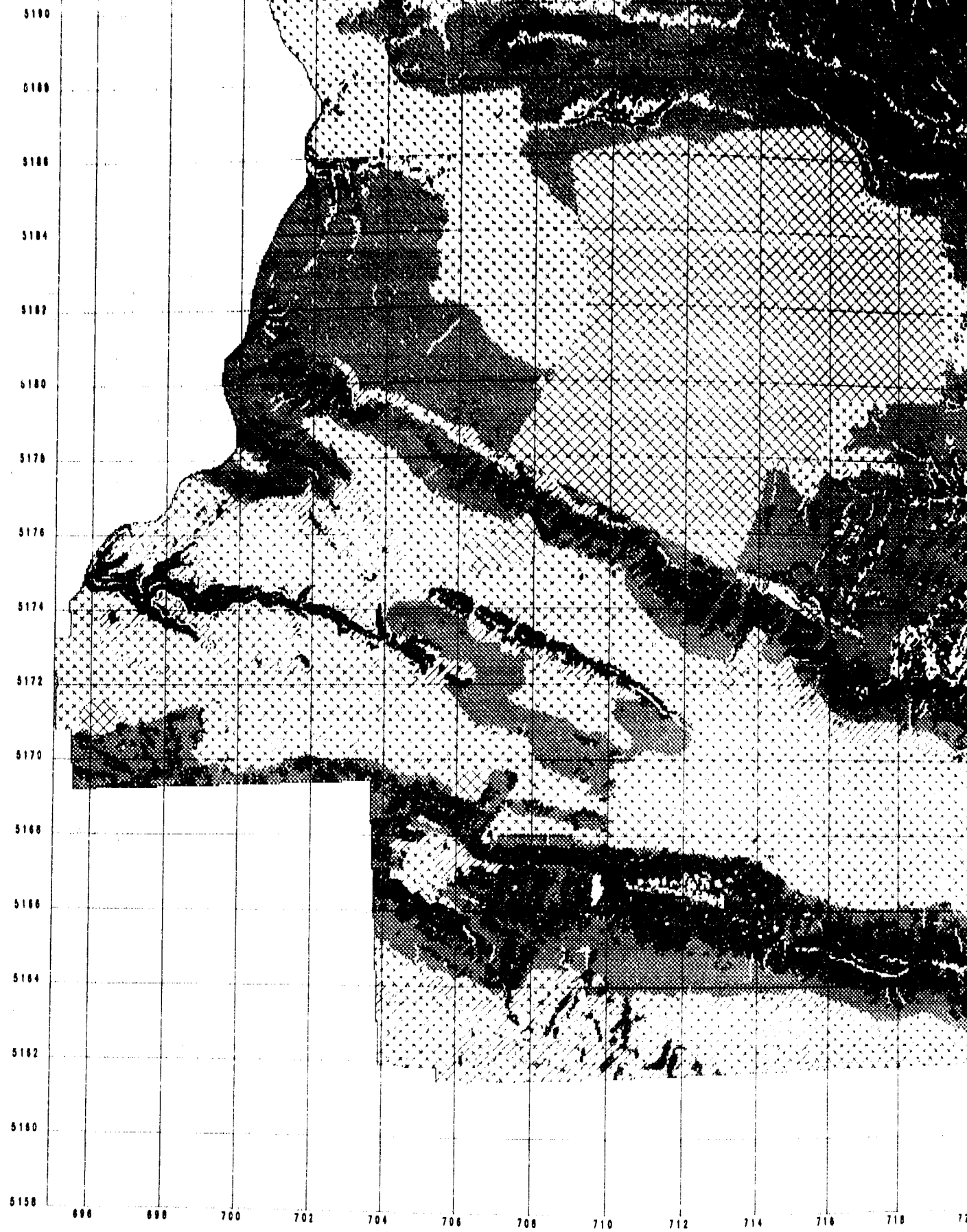


Plate 12. Speed limiting reason map for

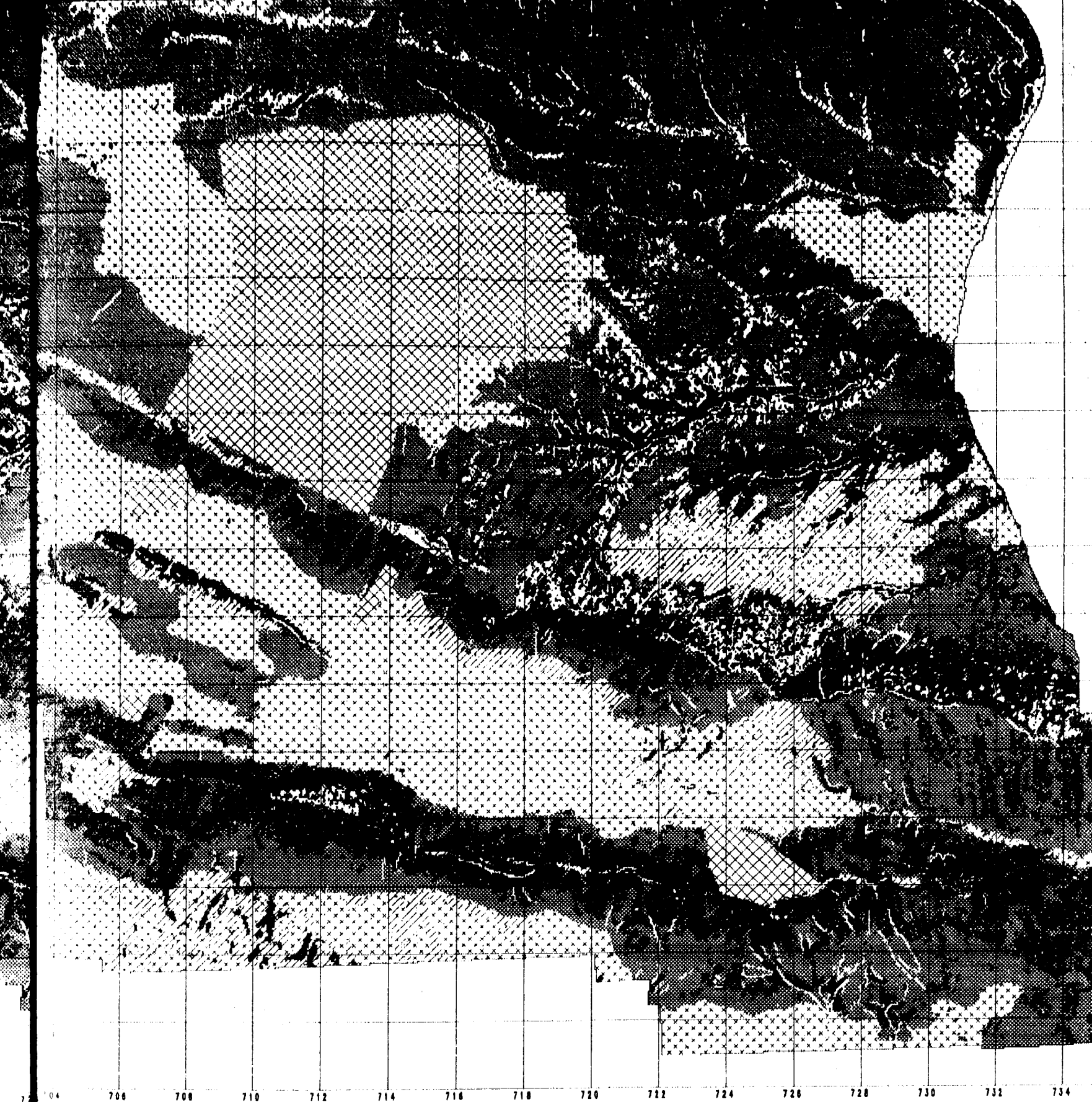














Plate 12. Speed limiting reason map for M998 (HMMWV) wheeled vehicle in the wet-wet slippery surf

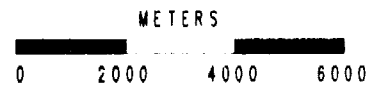
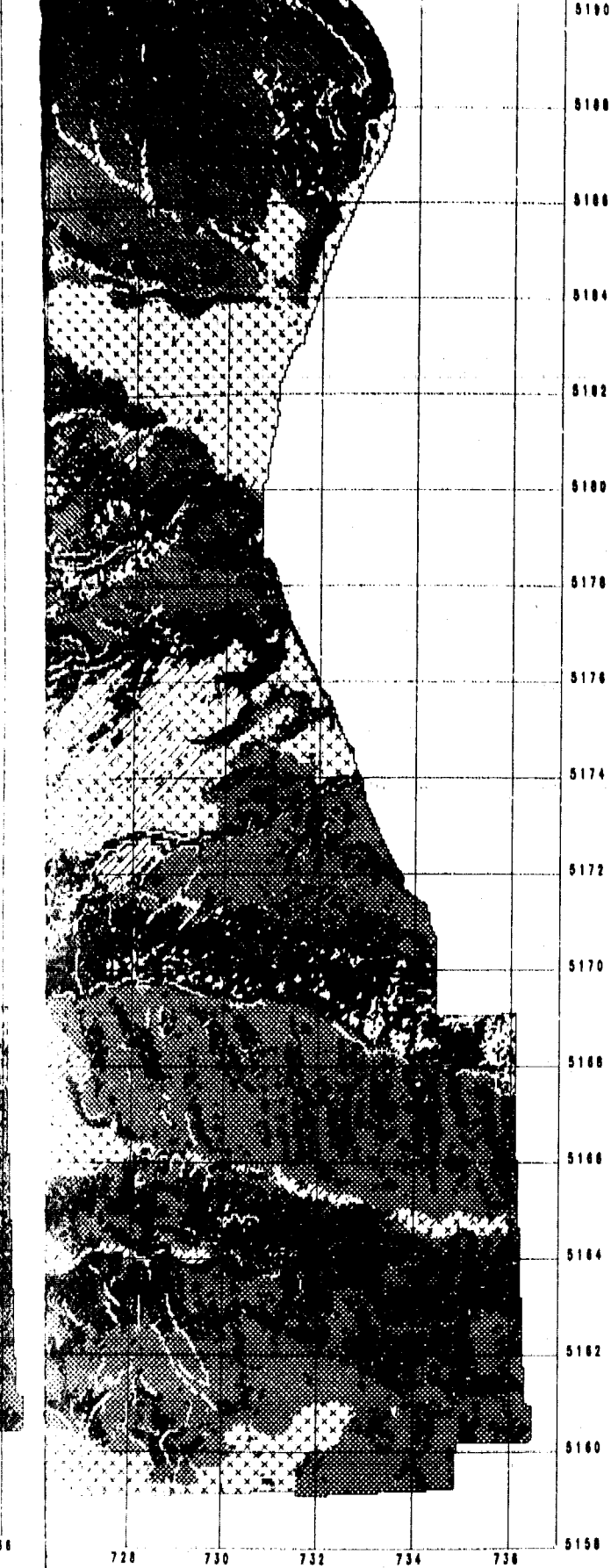
SPEED LIMITING REASON

SCALE 1:100000

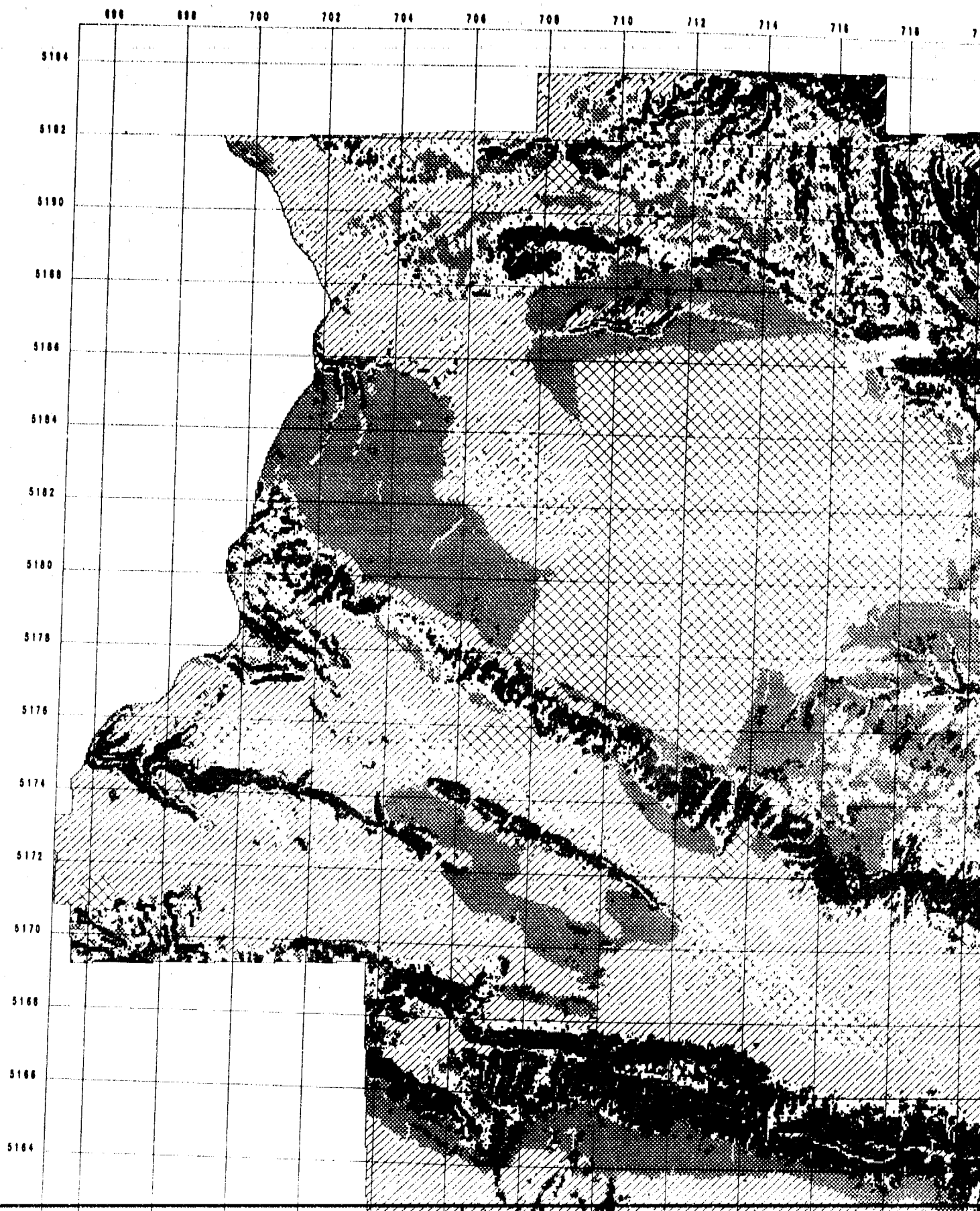
	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/ DECELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

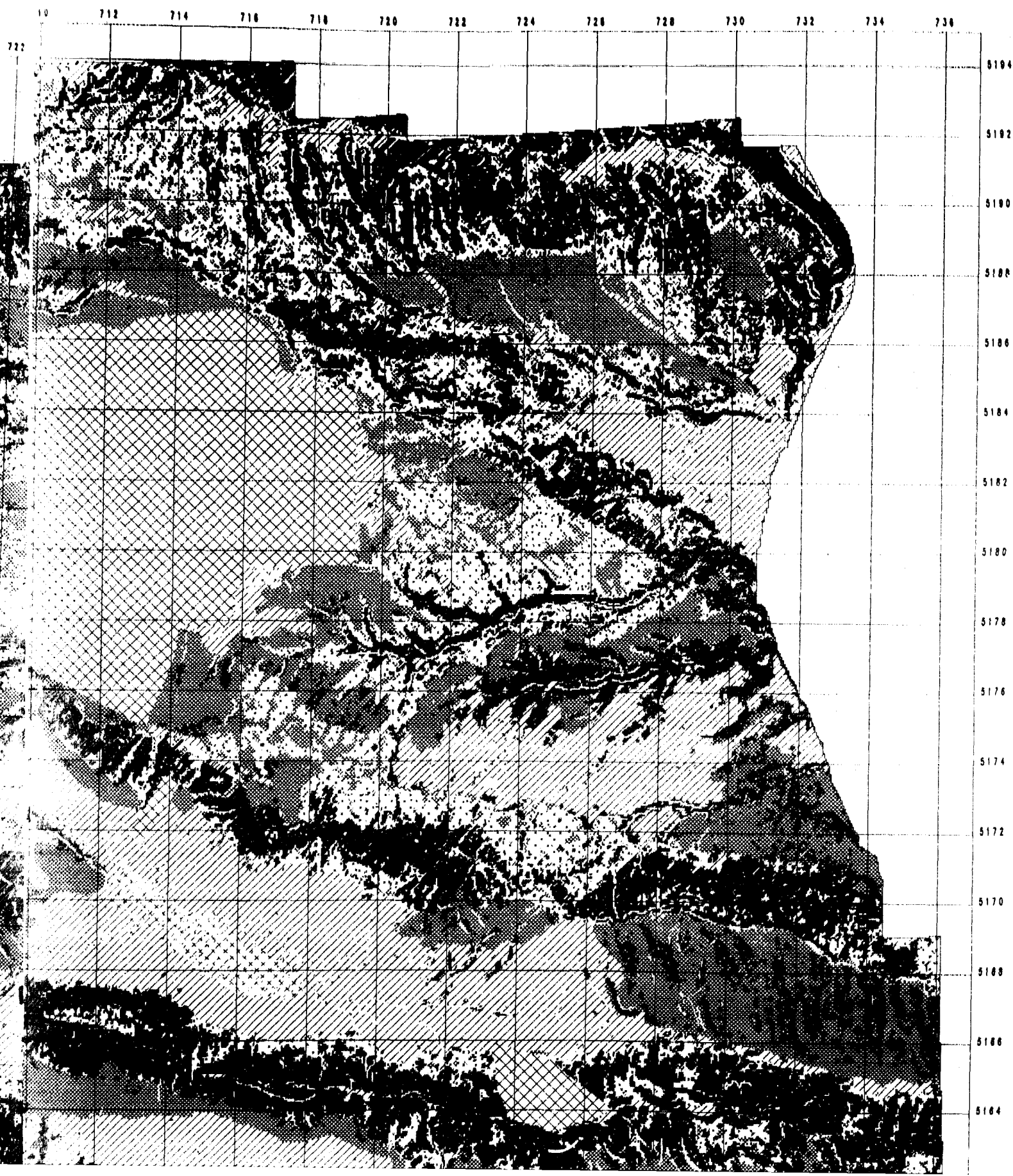
YAKIMA FIRING CENTER

HMMVV
WET-WET SEASON
SLIPPERY CONDITION



cond
hicle in the wet-wet slippery surface condition







728 730 732 734 736

5104

5102

5100

5108

5106

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



OBSTACLE



VISIBILITY



VEGETATION



ACCELERATION/
DECELERATION



MANEUVER



RIDE



CONE INDEX



TRACTION



RESISTANCE



SOIL/SLOPE



URBAN



COMBINATION OF ANY
TWO OR MORE FACTORS

YAKIMA FIRING CENTER

8x8 WHEELED COMBAT VEHICLE
WET-WET SEASON
SLIPPERY CONDITION

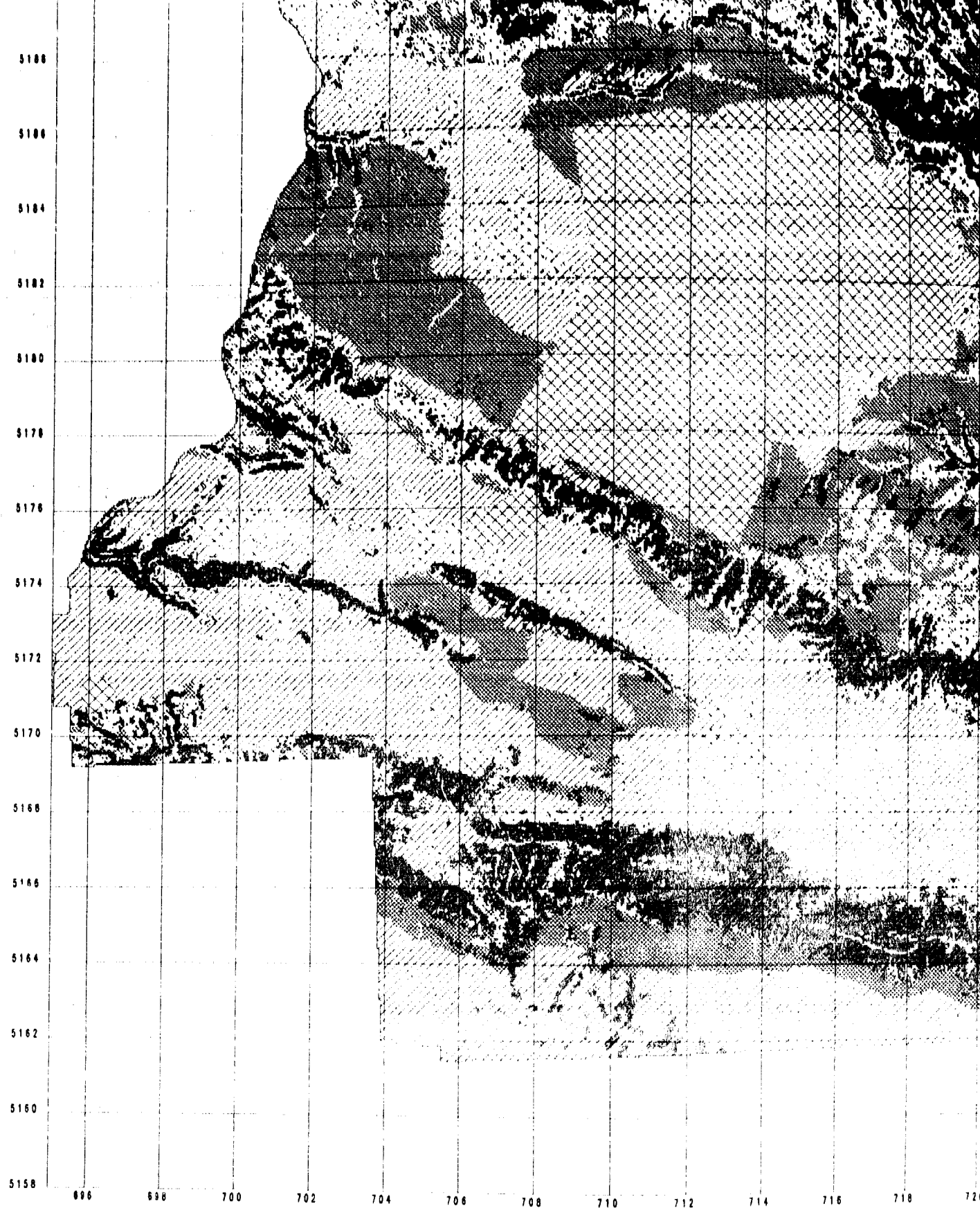


Plate 13. Speed limiting reason map



Plate 13. Speed limiting reason map for 8X8 wheeled combat vehicle in the wet-wet slippery

SPEED LIMITING REASON

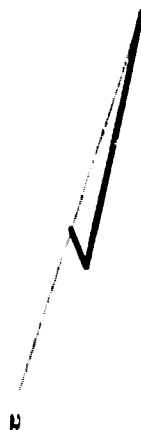
SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION/		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER
8X8 WHEELED COMBAT VEHICLE
WET-WET SEASON
SLIPPERY CONDITION

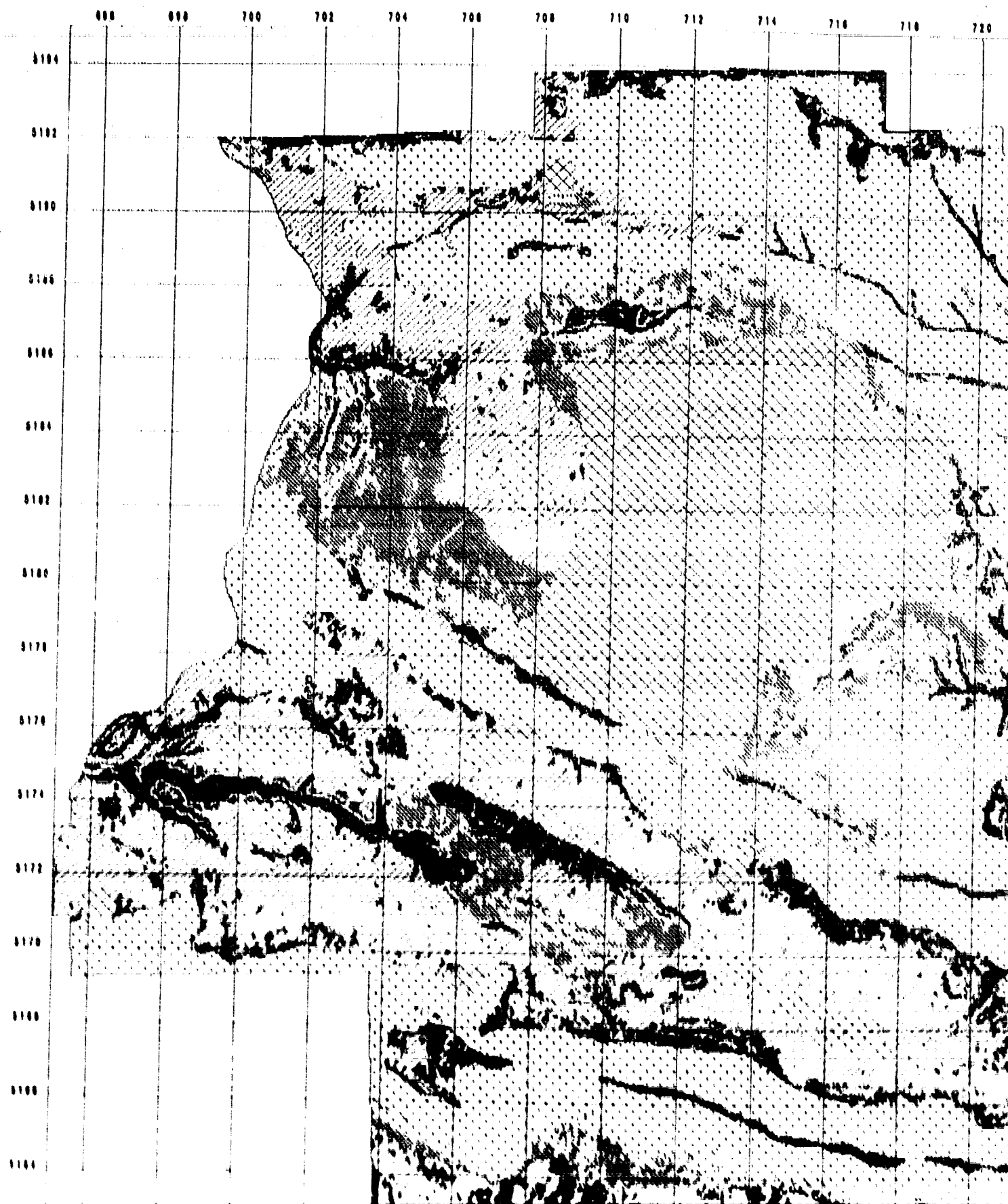
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160

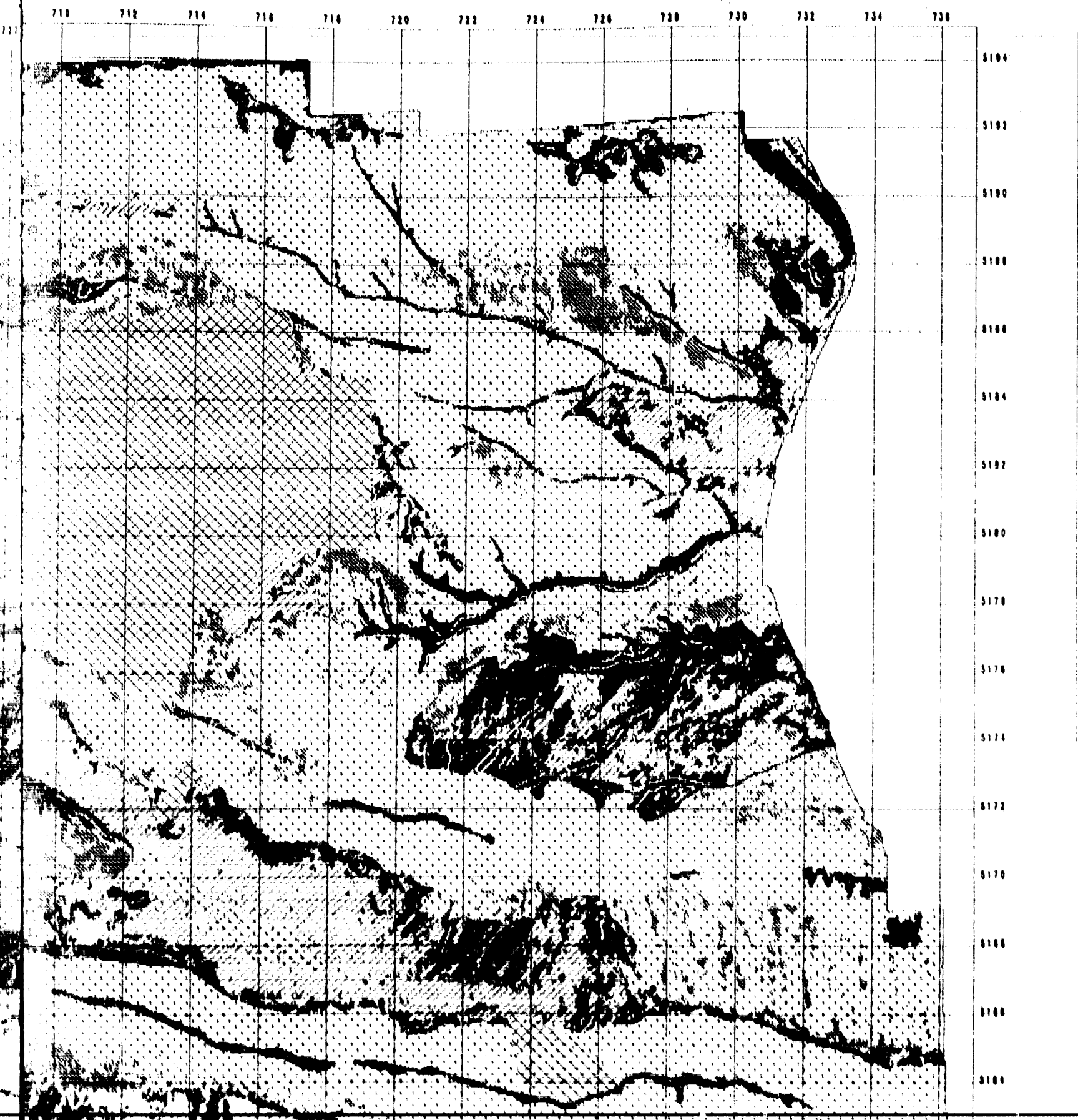
730 732 734 736



METERS
0 2000 4000 6000

in the wet-wet slippery surface condition





728 730 732 734 736

8194

8192

8190

8188

8186

8184

8182

8180

8178

8176

8174

8172

8170

8168

8166

8164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



OBSTACLE



VISIBILITY



VEGETATION



ACCELERATION/
DECCELERATION



MANEUVER



RIDE



CONE INDEX



TRACTION



RESISTANCE



SOIL/SLOPE



URBAN



COMBINATION OF ANY
TWO OR MORE FACTORS

YAKIMA FIRING CENTER

M60A3

WET-WET SEASON
SLIPPERY CONDITION

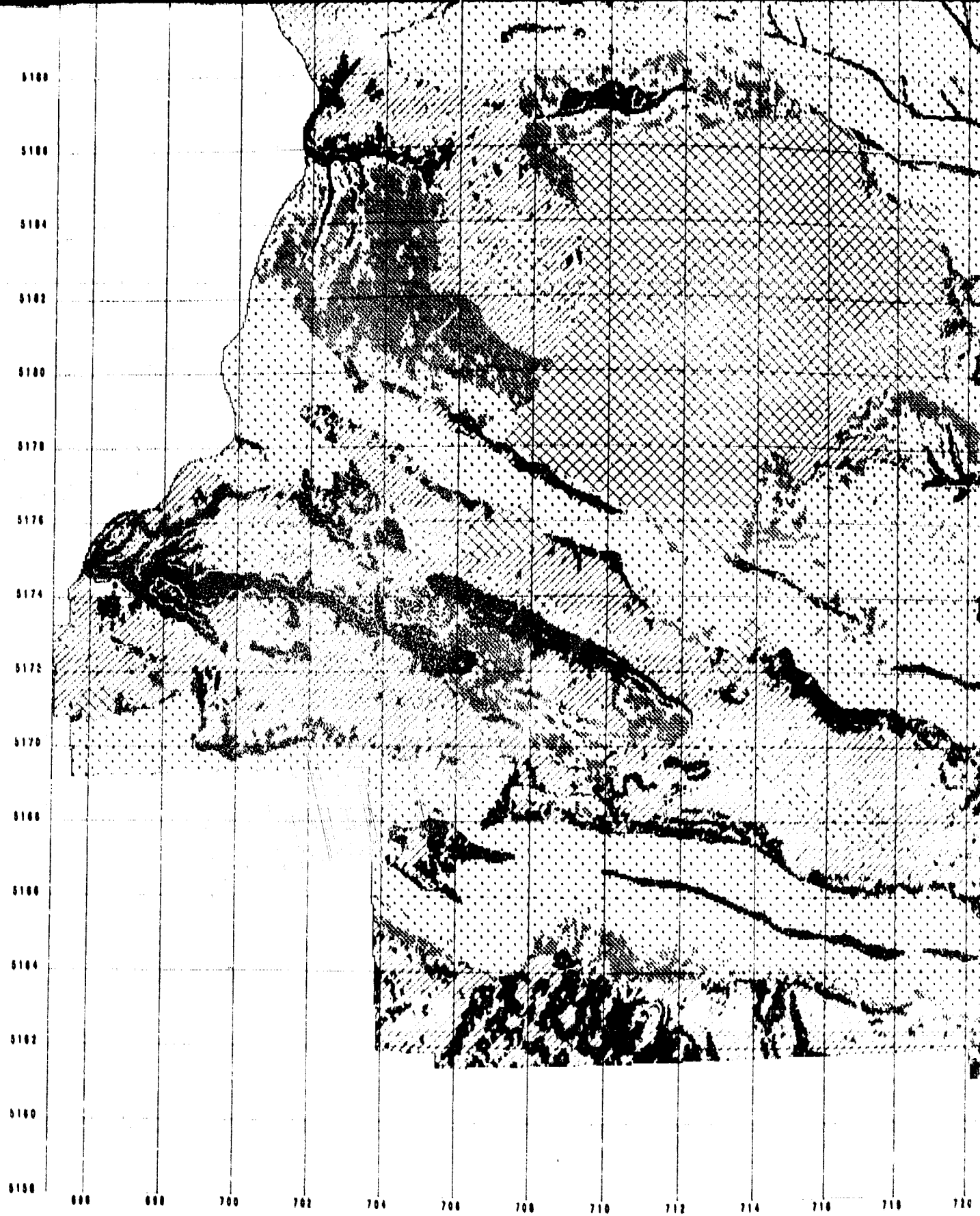


Plate 14. Speed limiting reason ma

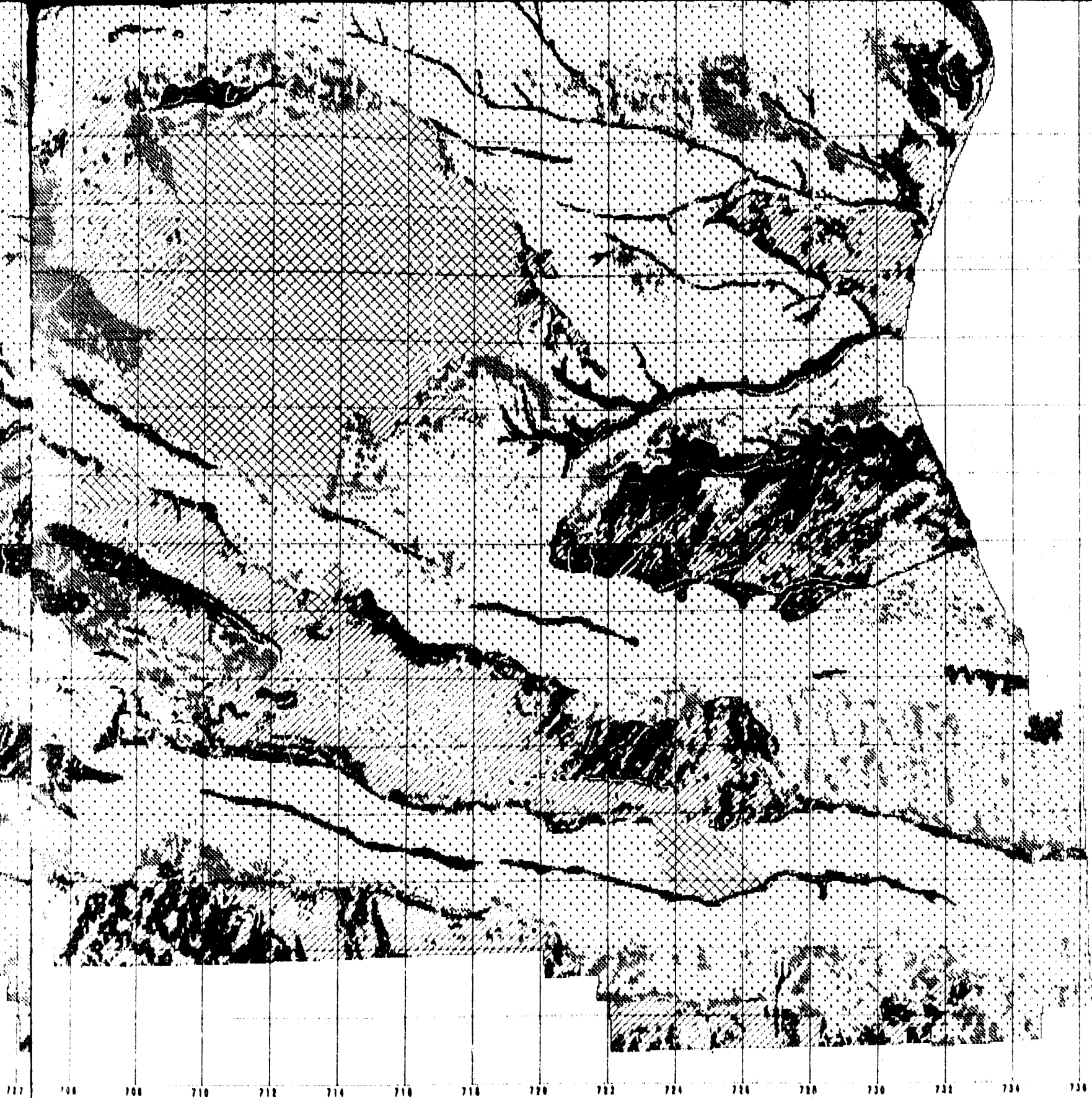
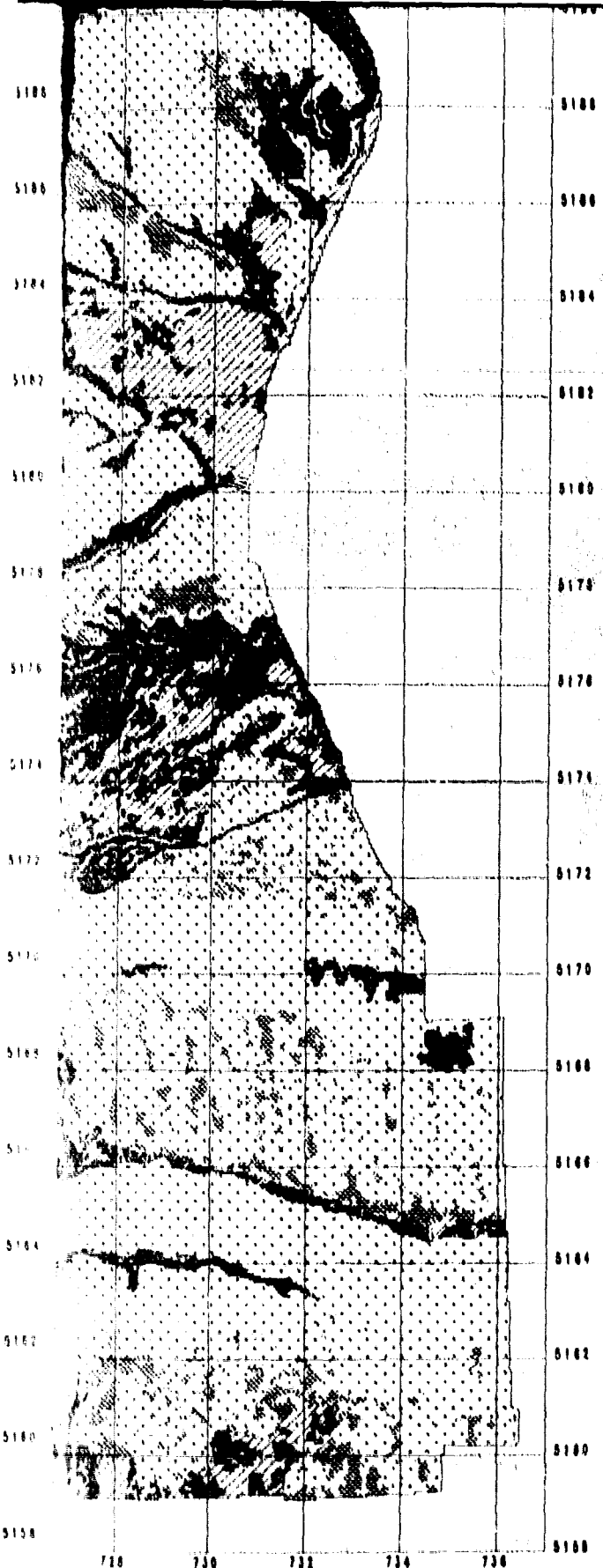


Plate 14. Speed limiting reason map for M60A3 combat tank in the wet-wet slippery surface condition.



SPEED LIMITING REASON

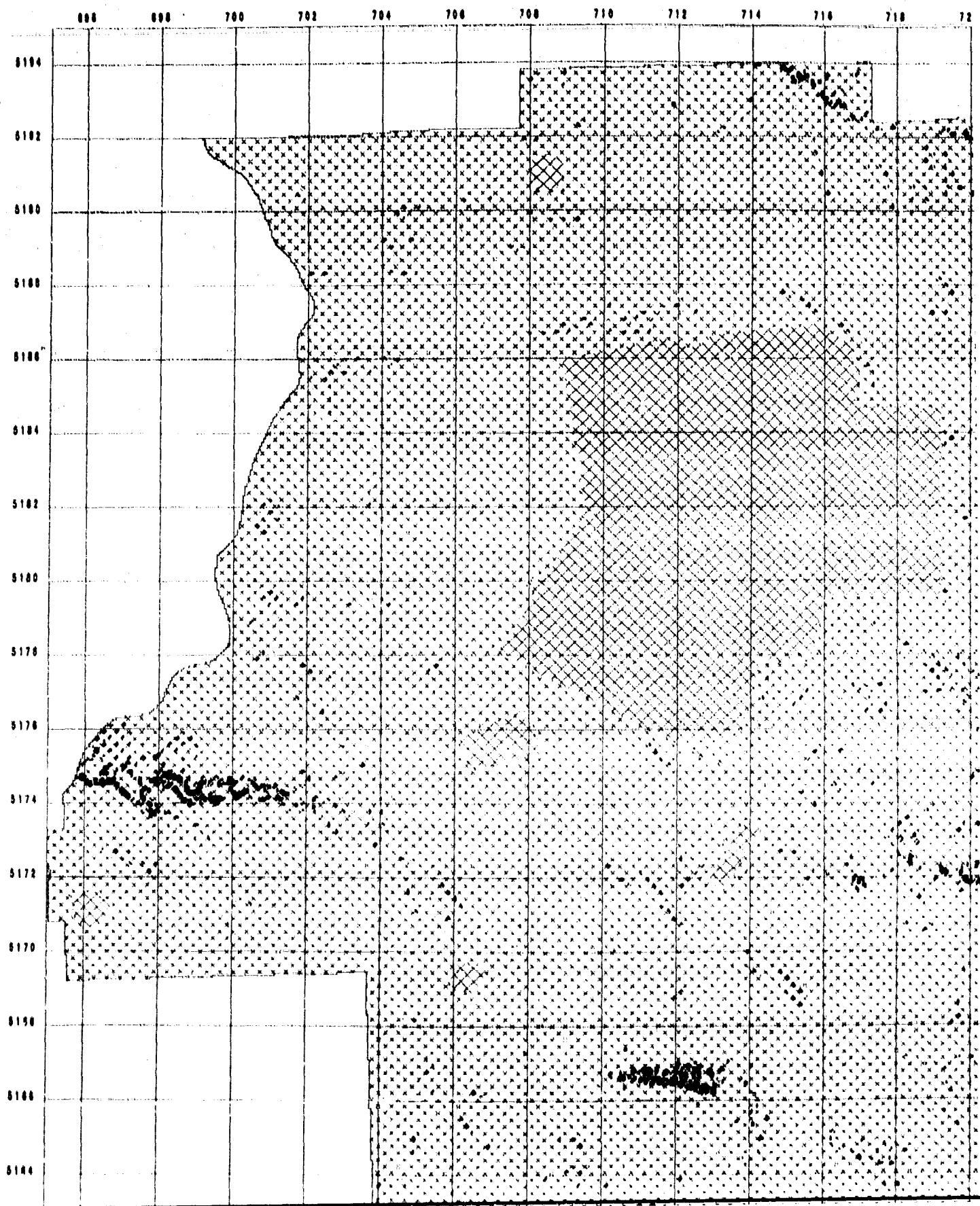
SCALE 1:100000

	OBSTACLE		CONE INDEX
	VISIBILITY		TRACTION
	VEGETATION		RESISTANCE
	ACCELERATION		SOIL/SLOPE
	MANEUVER		URBAN
	RIDE		COMBINATION OF ANY TWO OR MORE FACTORS

YAKIMA FIRING CENTER
M60A3
WET-WET SEASON
SLIPPERY CONDITION



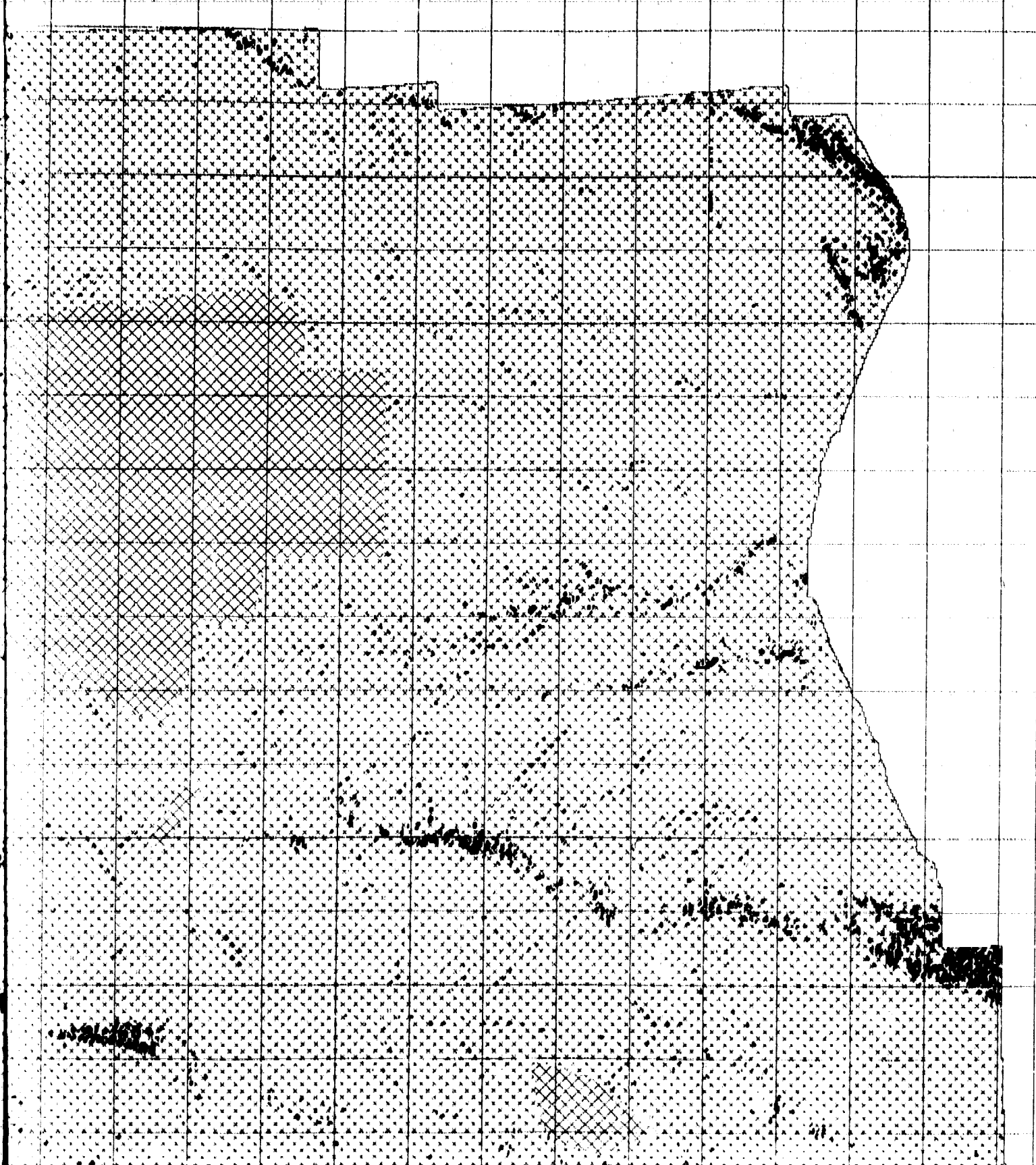
on the wet-wet slippery surface condition



722

710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184
5182
5180
5180
5180
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164



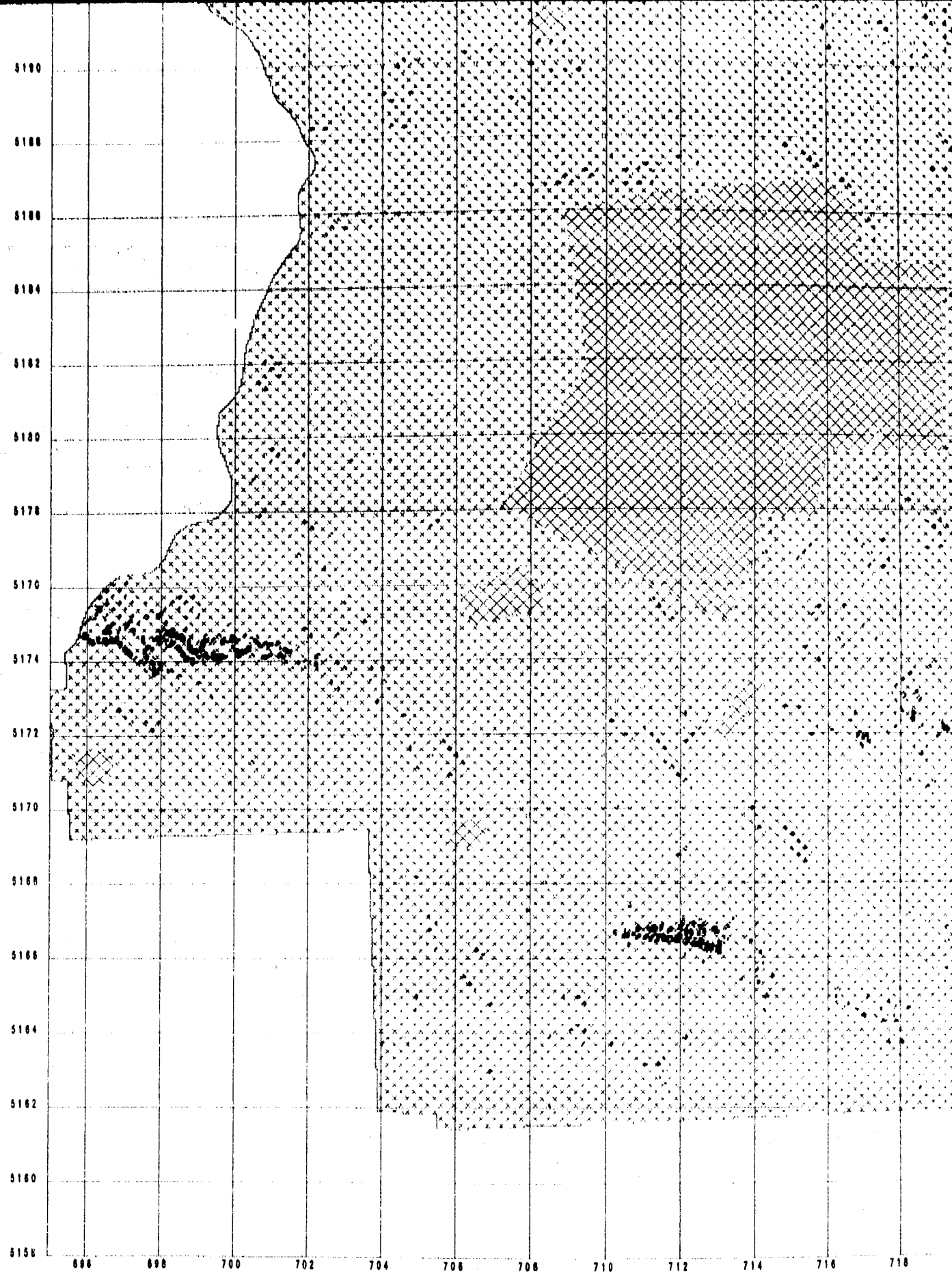


Plate 15. Ten pass soil disturbance level map

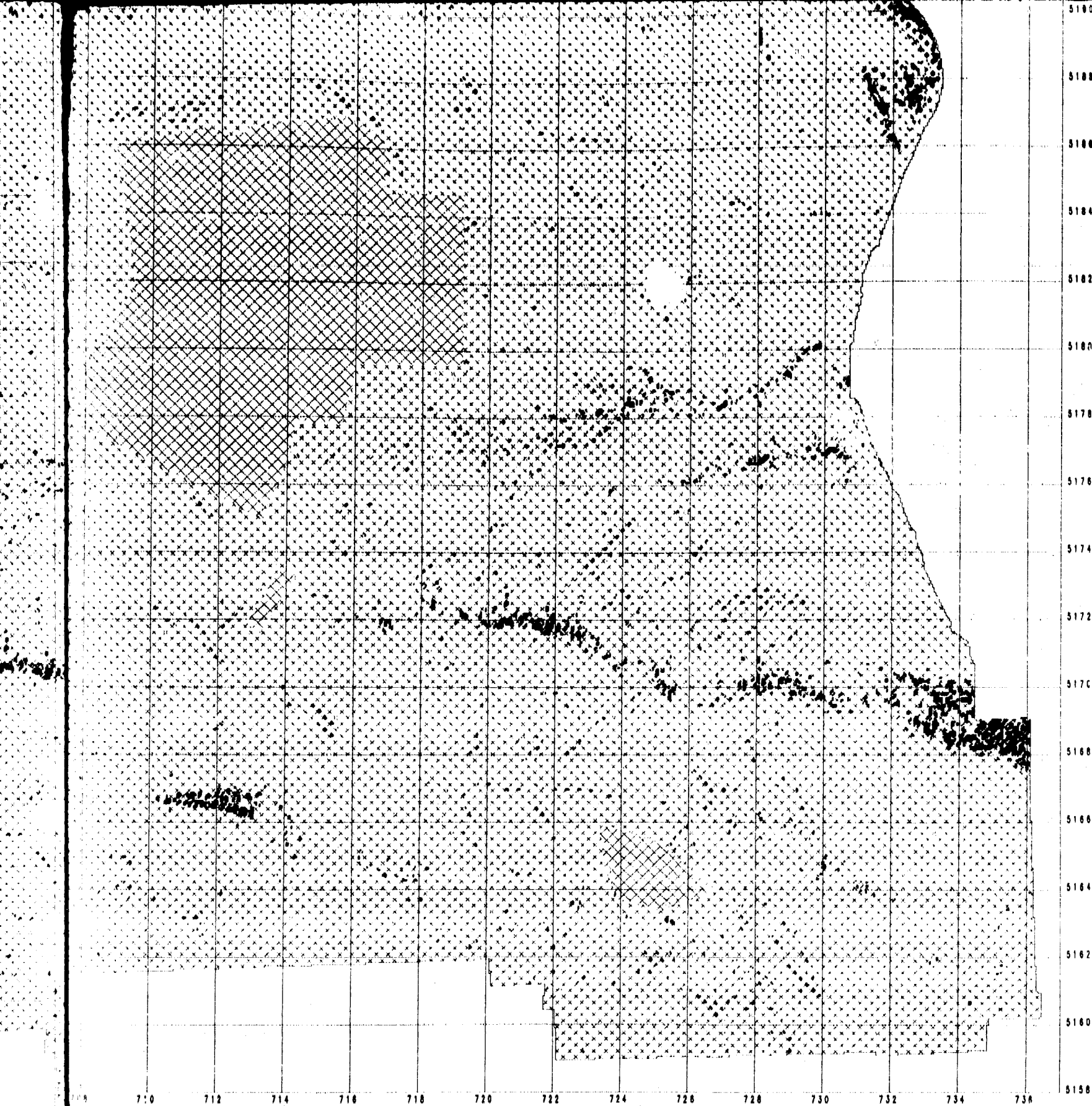
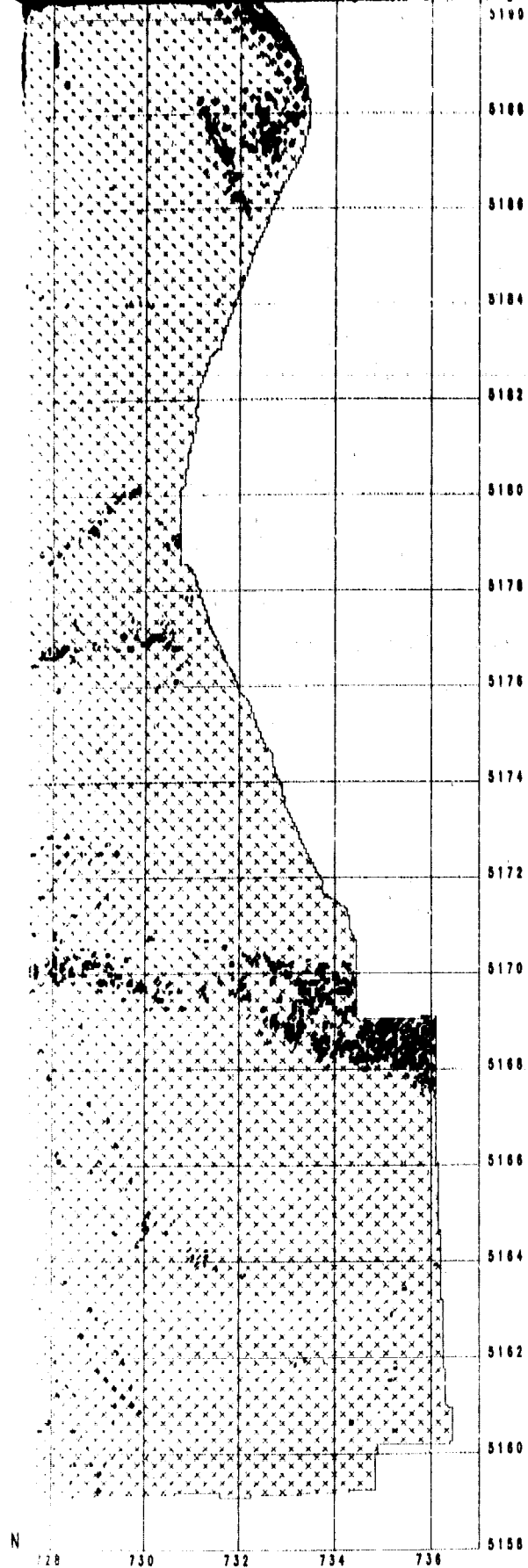
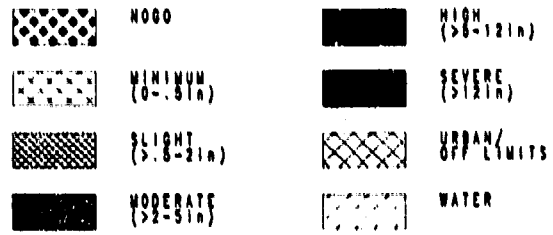


Plate 15. Ten pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface



SOIL DISTURBANCE LEVELS

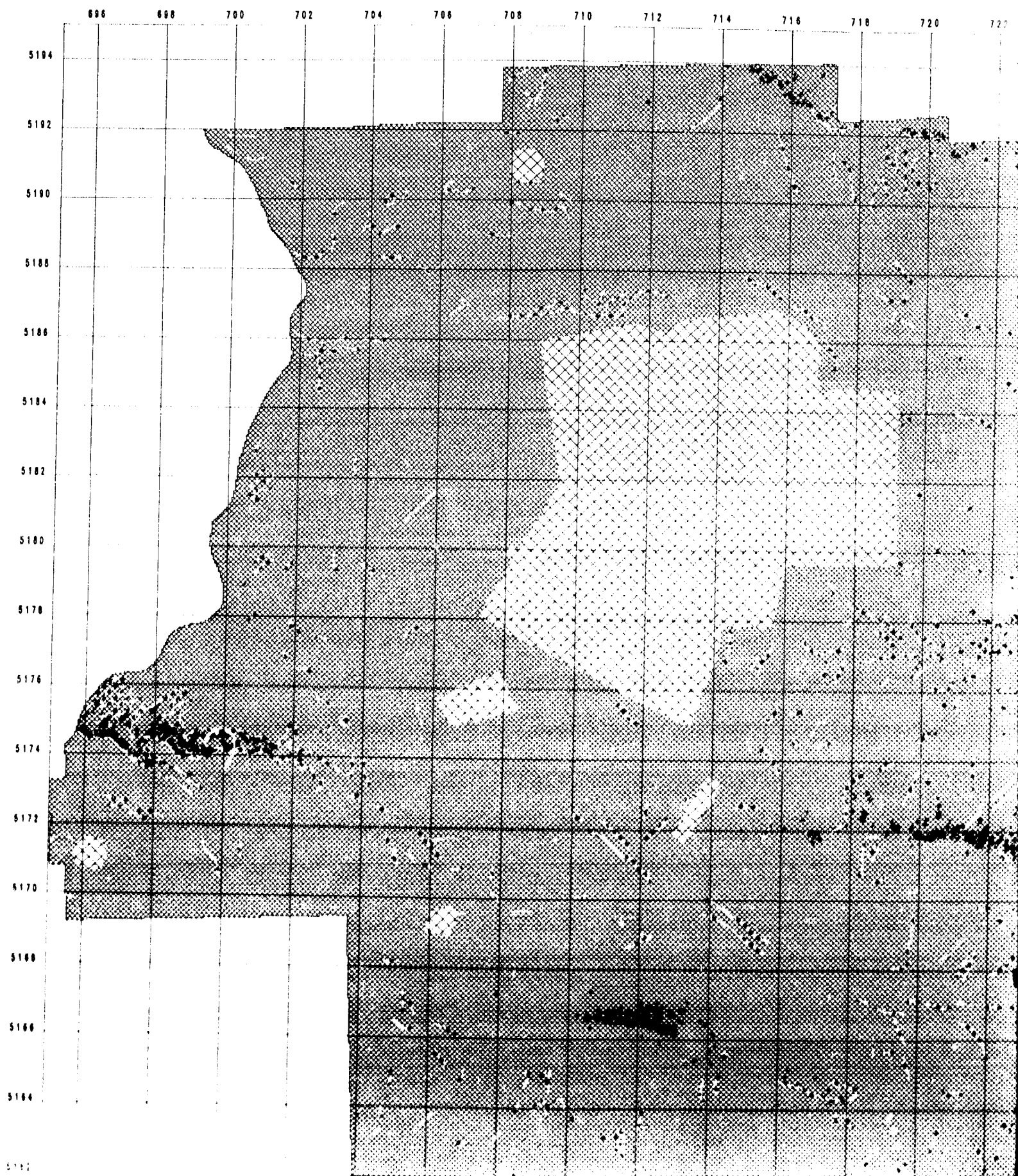
SCALE 1:100000



YAKIMA FIRING CENTER
S-3-S FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES



ition rce structures in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

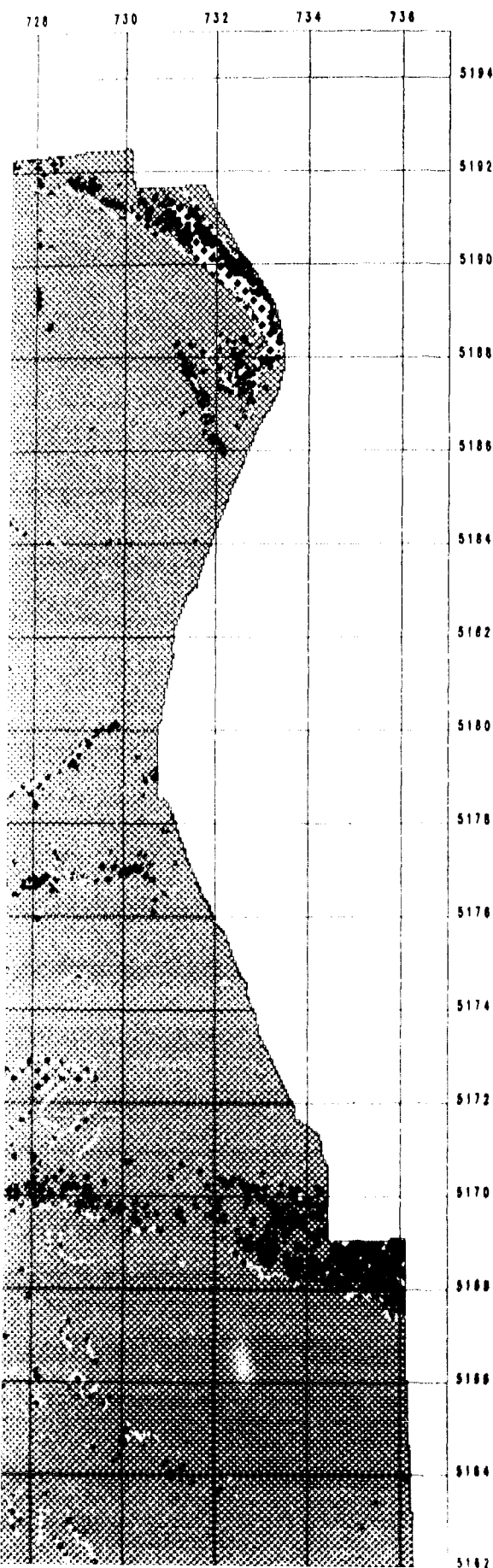
5168

5166

5164

5162





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

YAKIMA FIRING CENTER

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

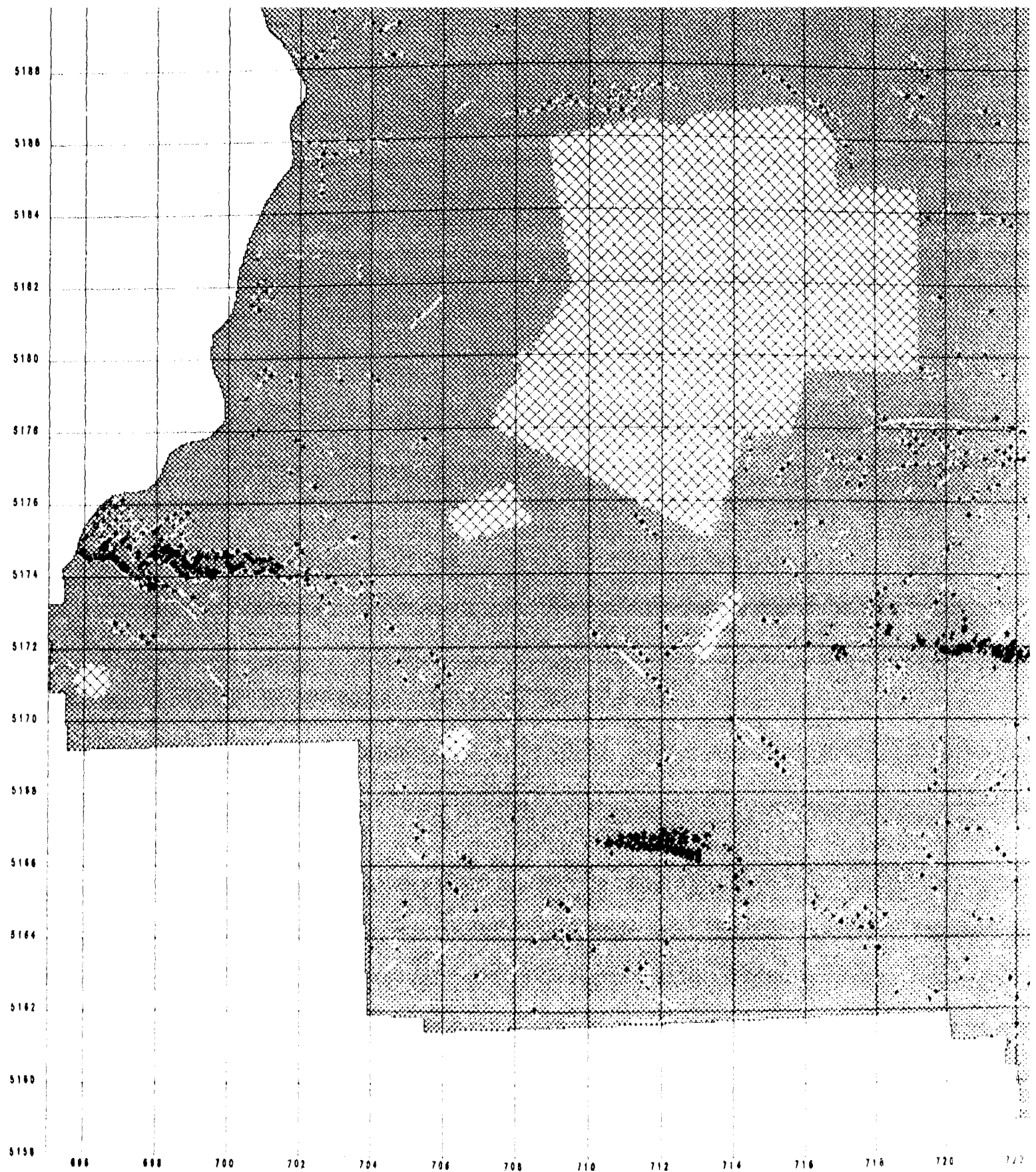
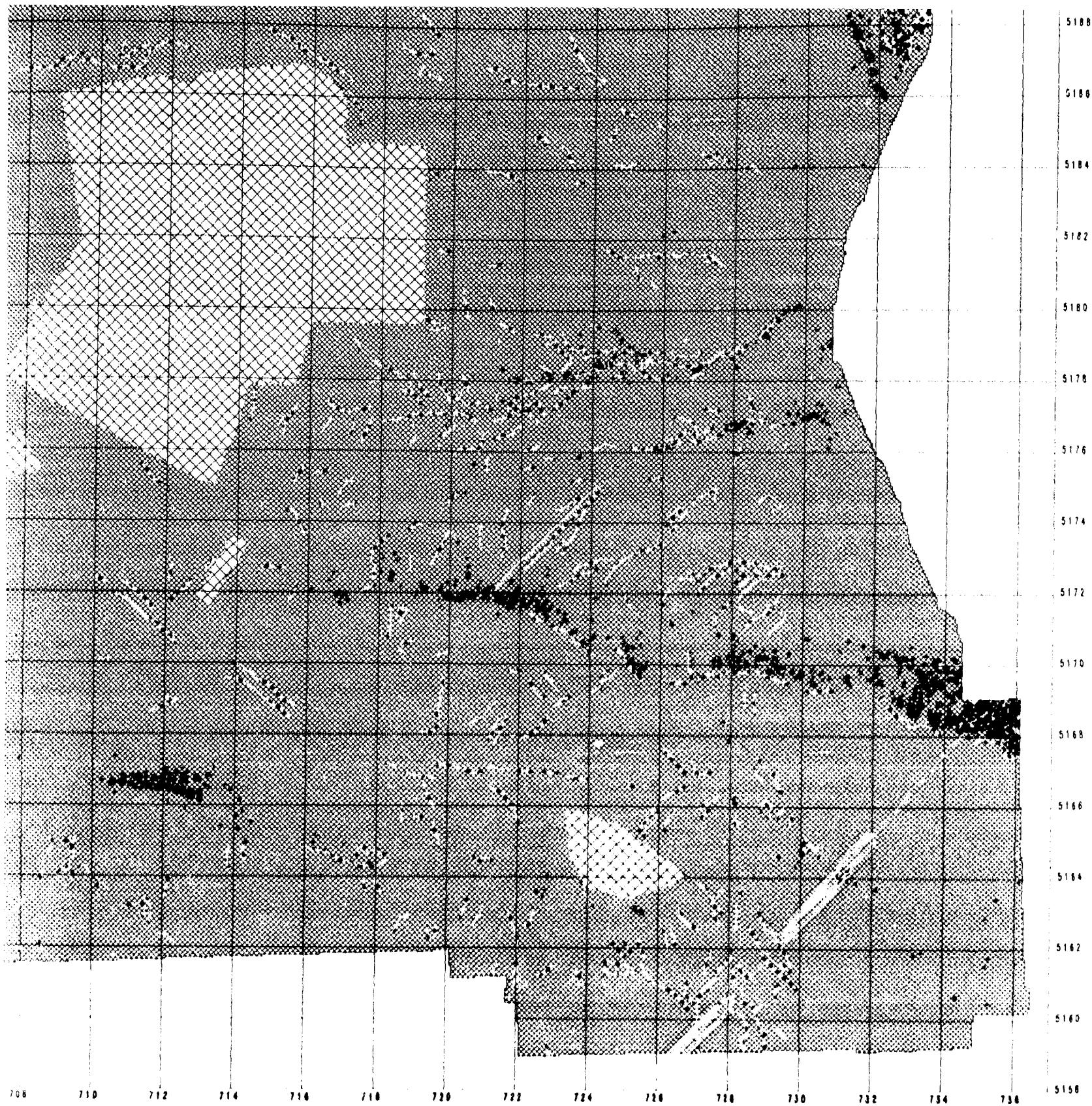
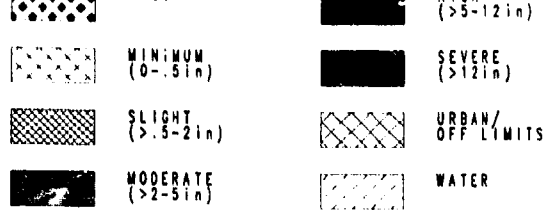
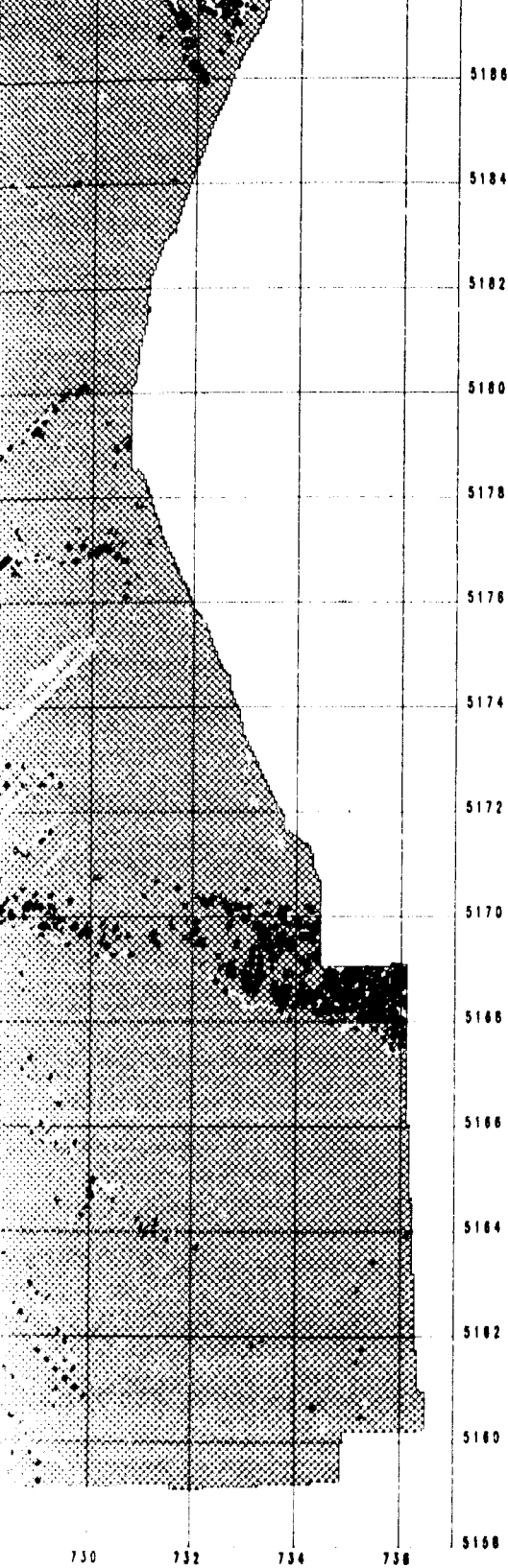


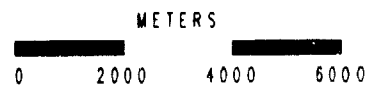
Plate 16. Fifty pass soil disturbance level map for 3-3-5 a



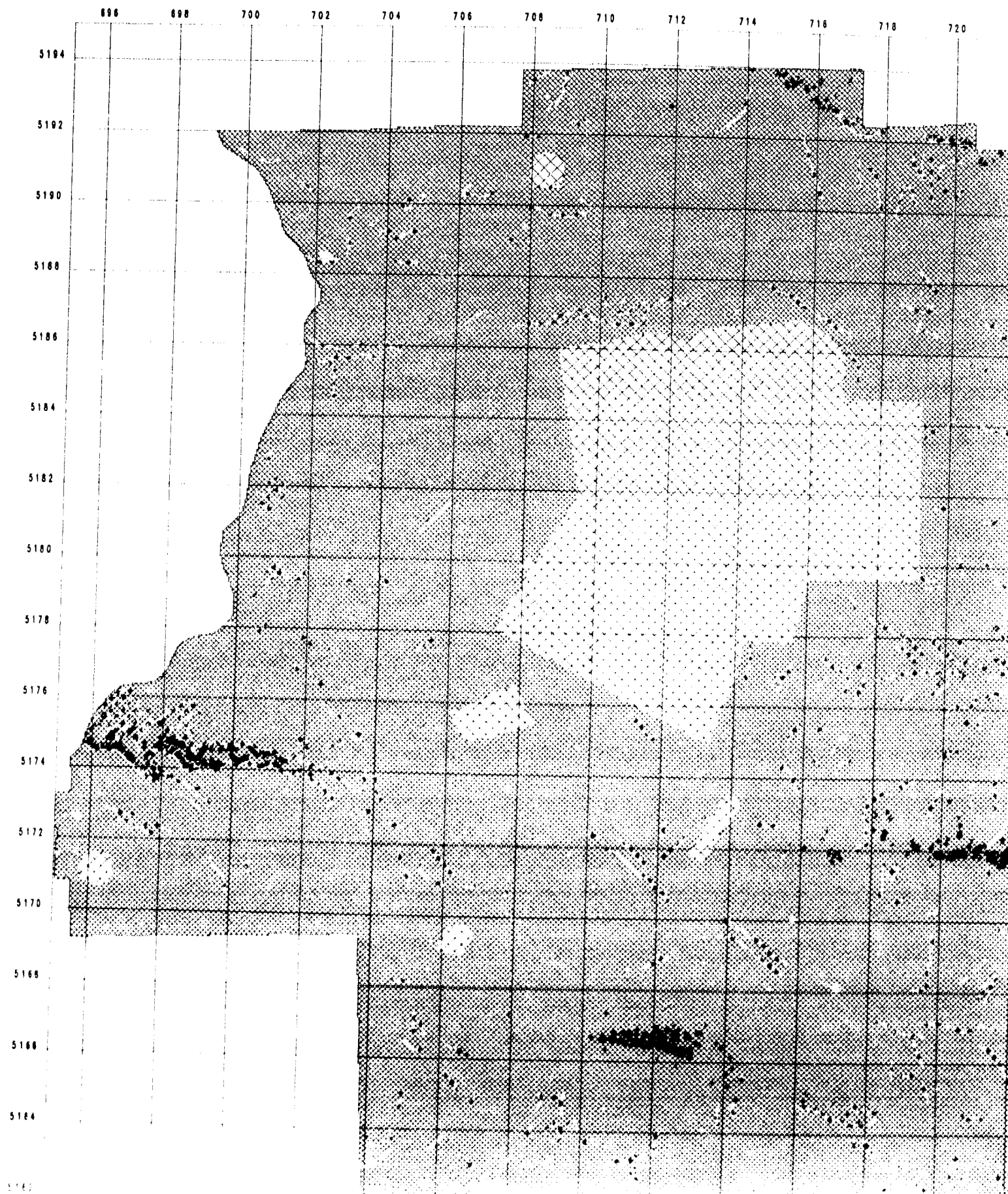
ate 16. Fifty pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force astructures in the dry normal surface condition



YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES



structures in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

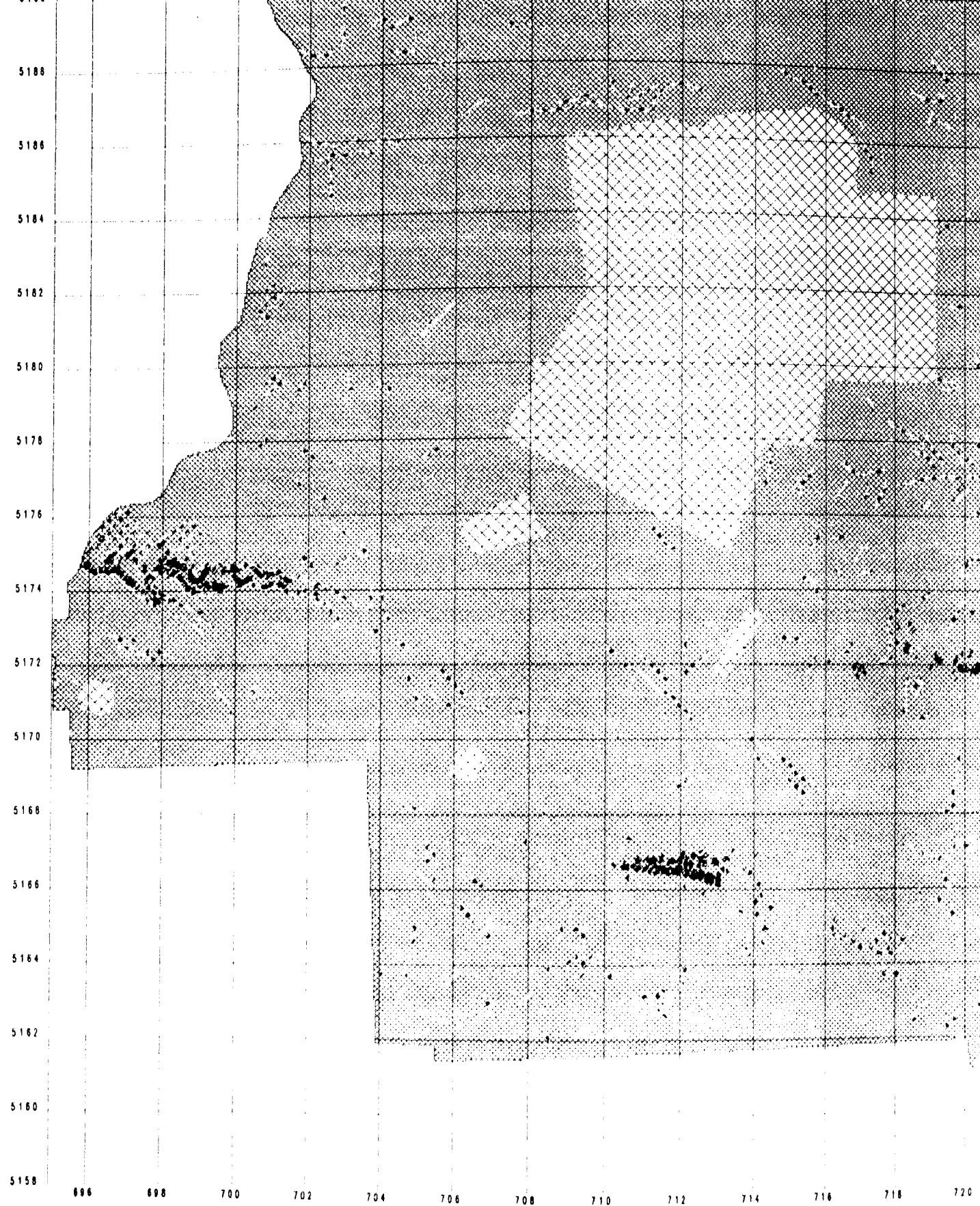
YAKIMA FIRING CENTER

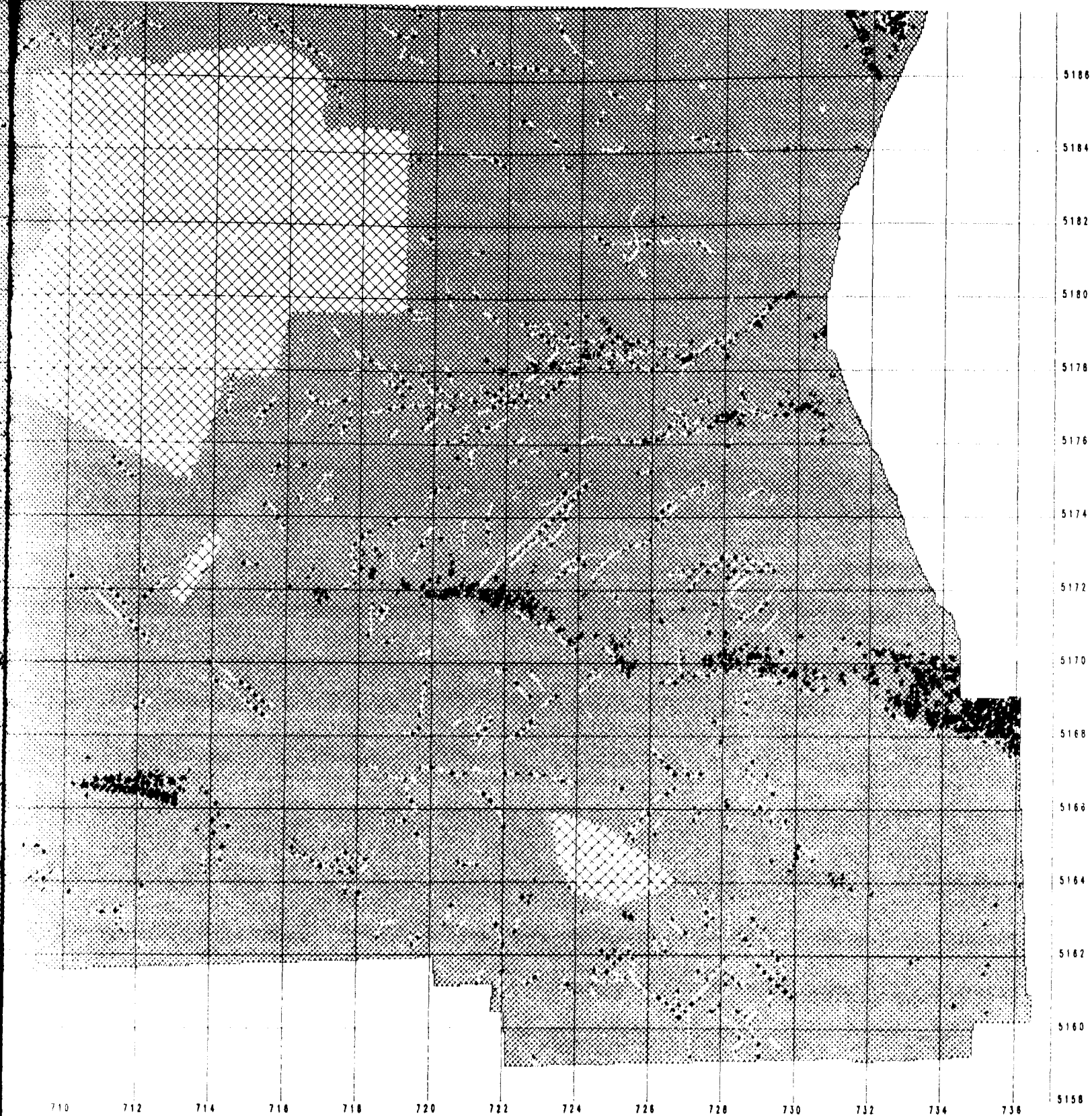
3-3-5 FORCE STRUCTURE

DRY SEASON
NORMAL CONDITION
1000 PASSES

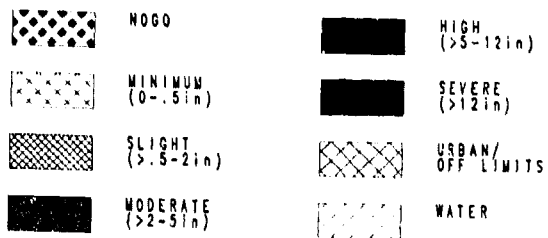
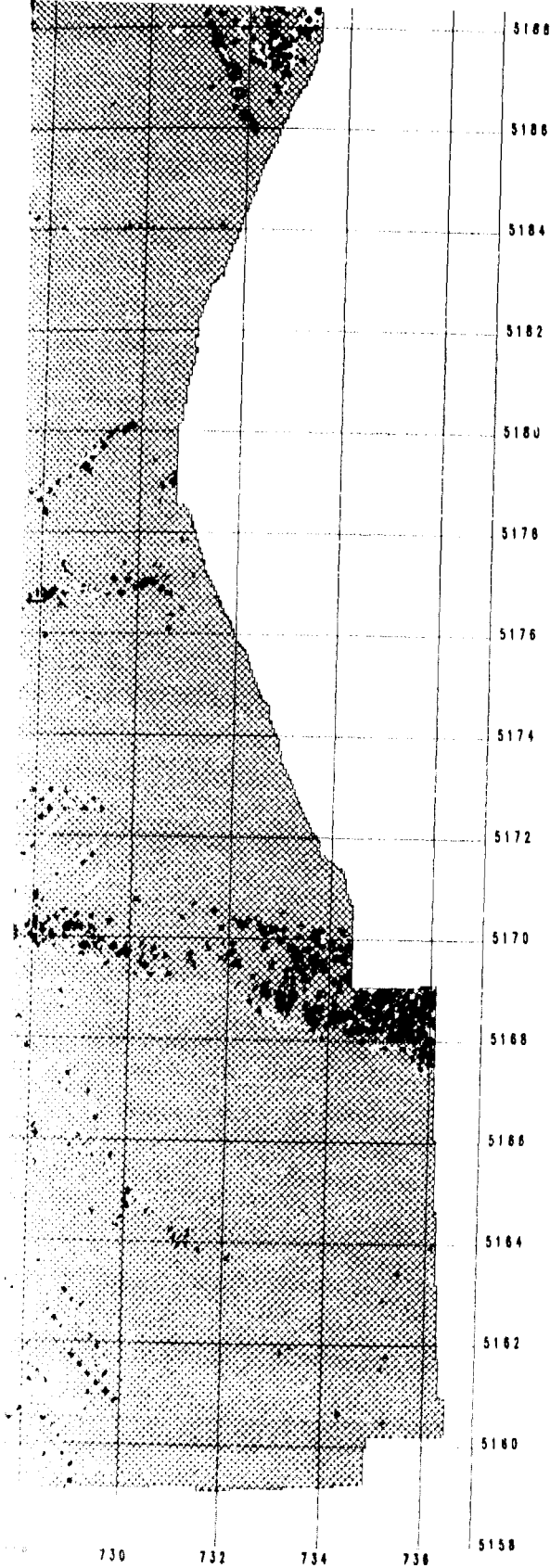


METERS

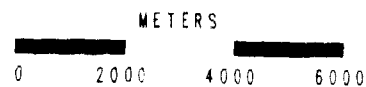




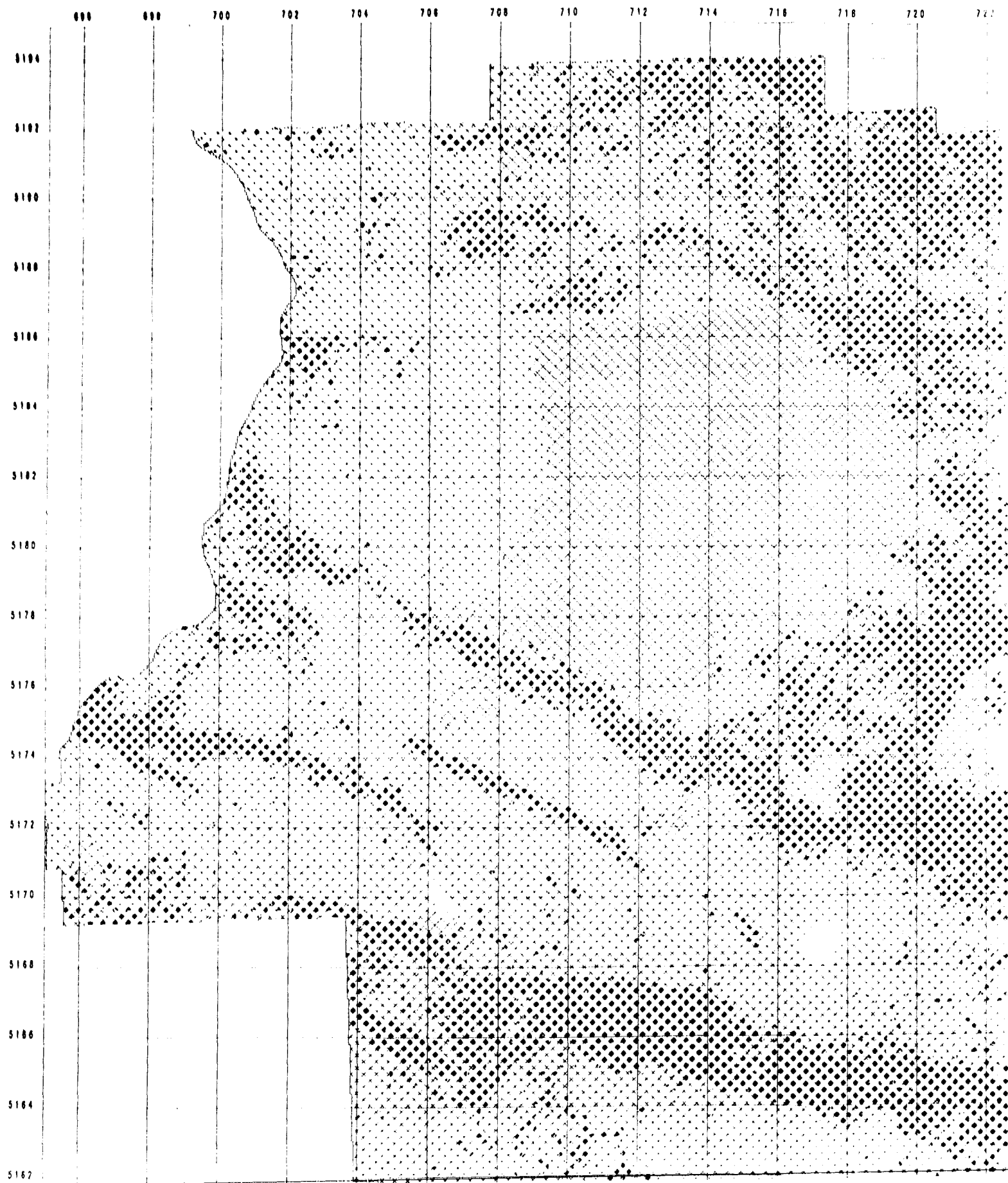
One thousand pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condi



YAKIMA FIRING CENTER
 3-3-5 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 1000 PASSES



Force structures in the dry normal surface condition



0 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

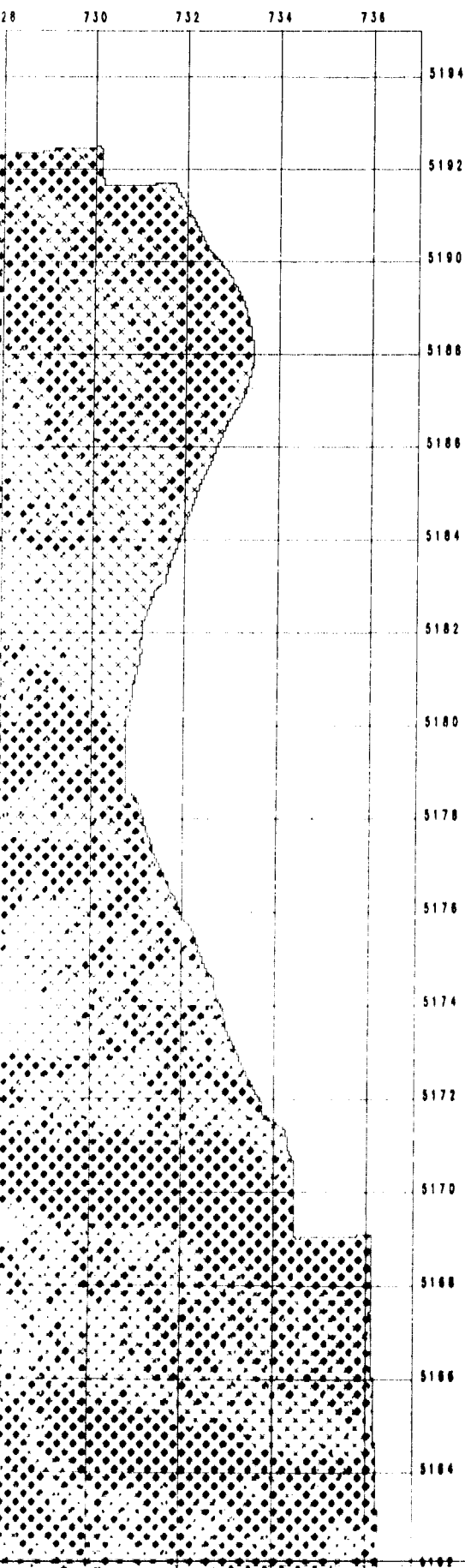
5168

5166

5164

5162





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



MINIMUM
(0-.5in)



SLIGHT
(.5-2in)



MODERATE
(2-5in)



HIGH
(>5-12in)



SEVERE
(>12in)



URBAN/
OFF LIMITS



WATER

YAKIMA FIRING CENTER

3-3-5 FORCE STRUCTURE

WET-WET SEASON

SLIPPERY CONDITION

10 PASSES

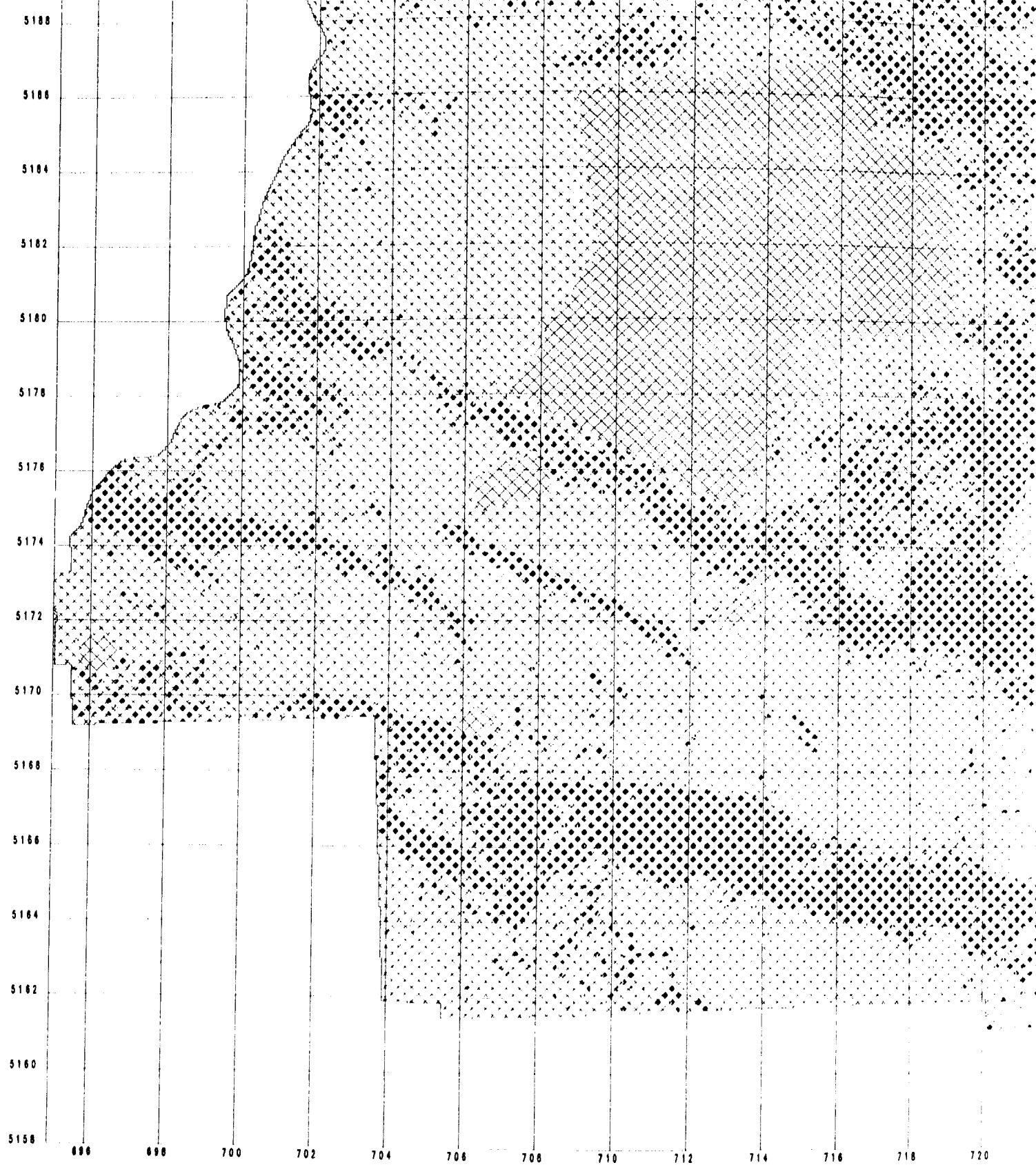
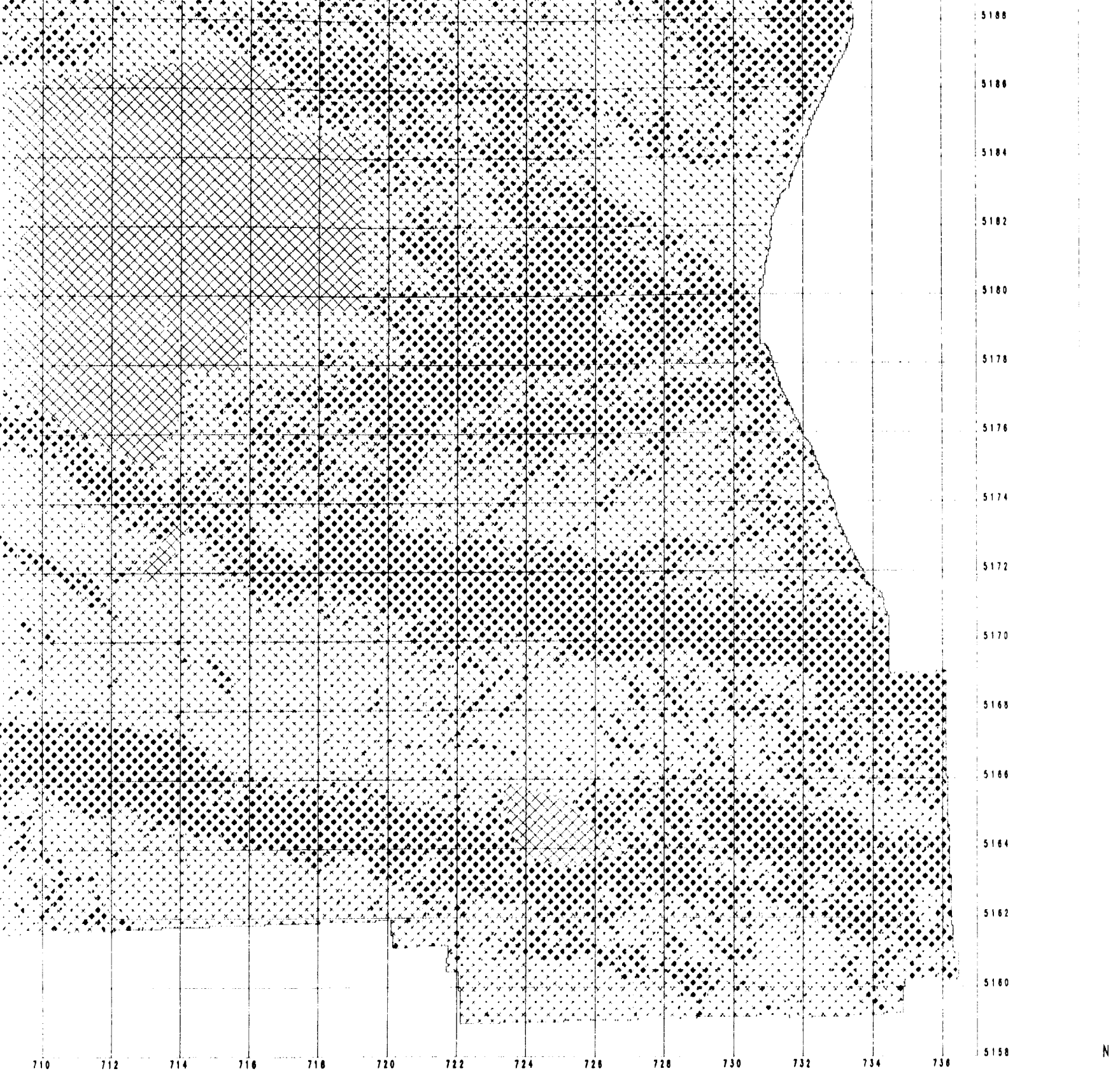
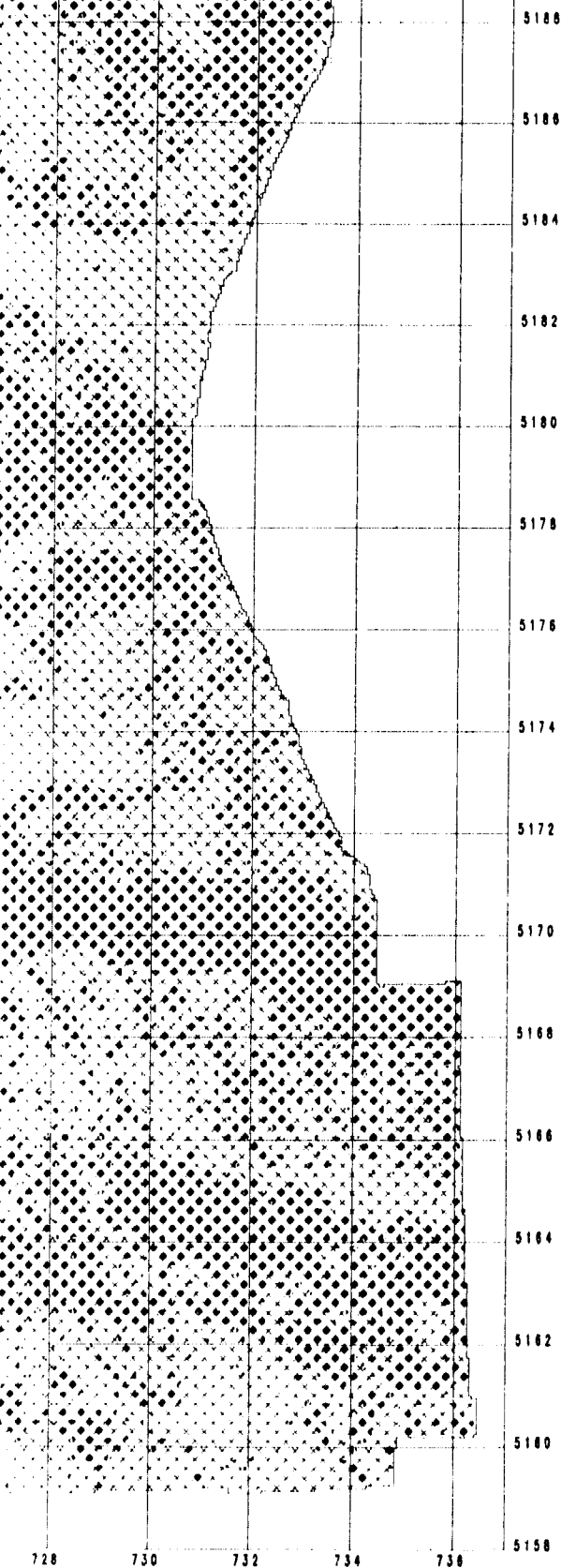


Plate 18. Ten pass soil disturbance level map for 3



ate 18. Ten pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface condi



NOGO



HIGH
(>5-12in)



MINIMUM
(0-.5in)



SEVERE
(>12in)



SLIGHT
(>.5-2in)



URBAN/
OFF LIMITS

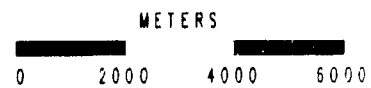


MODERATE
(>2-5in)

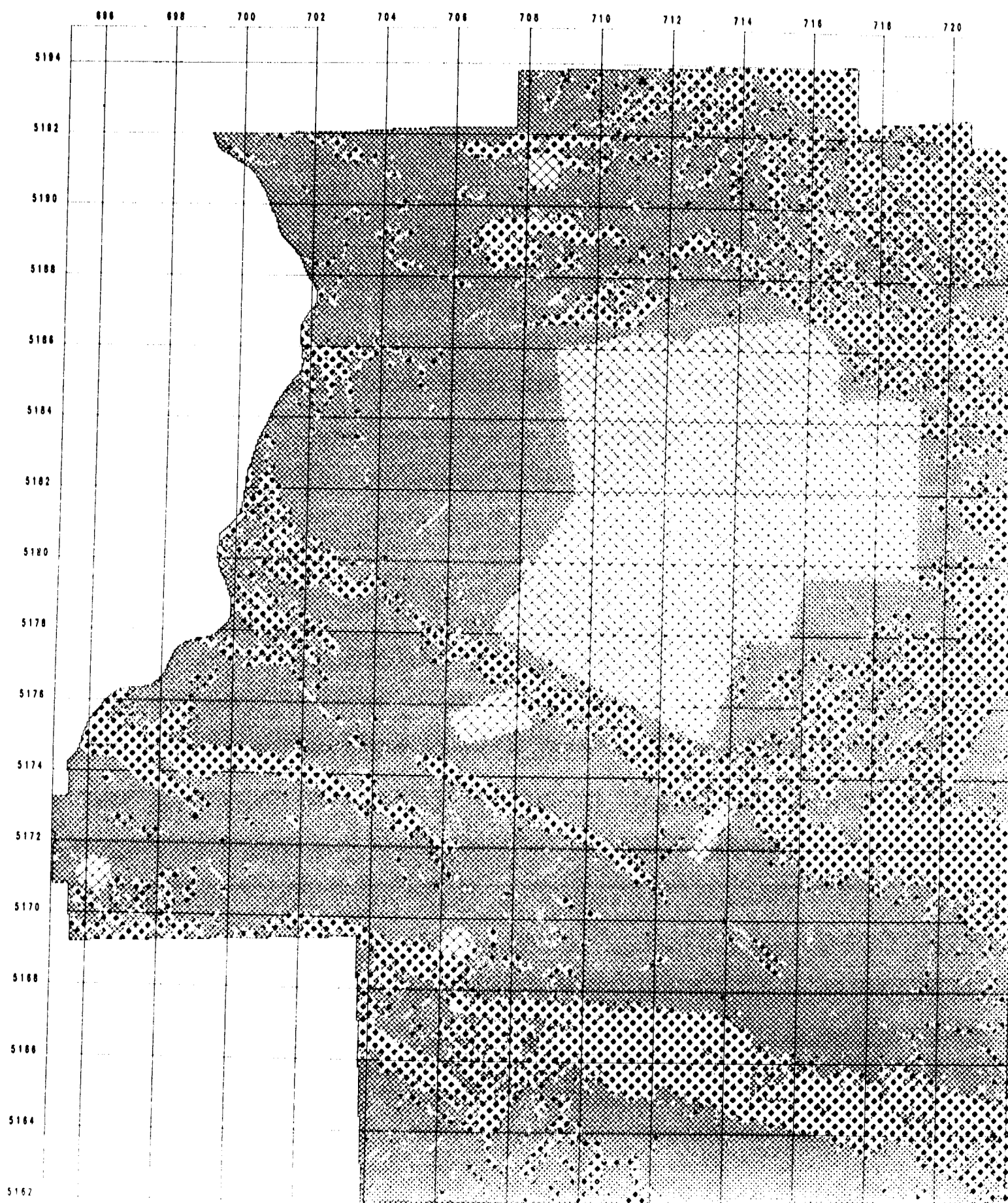


WATER

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES



force structures in the wet-wet slippery surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

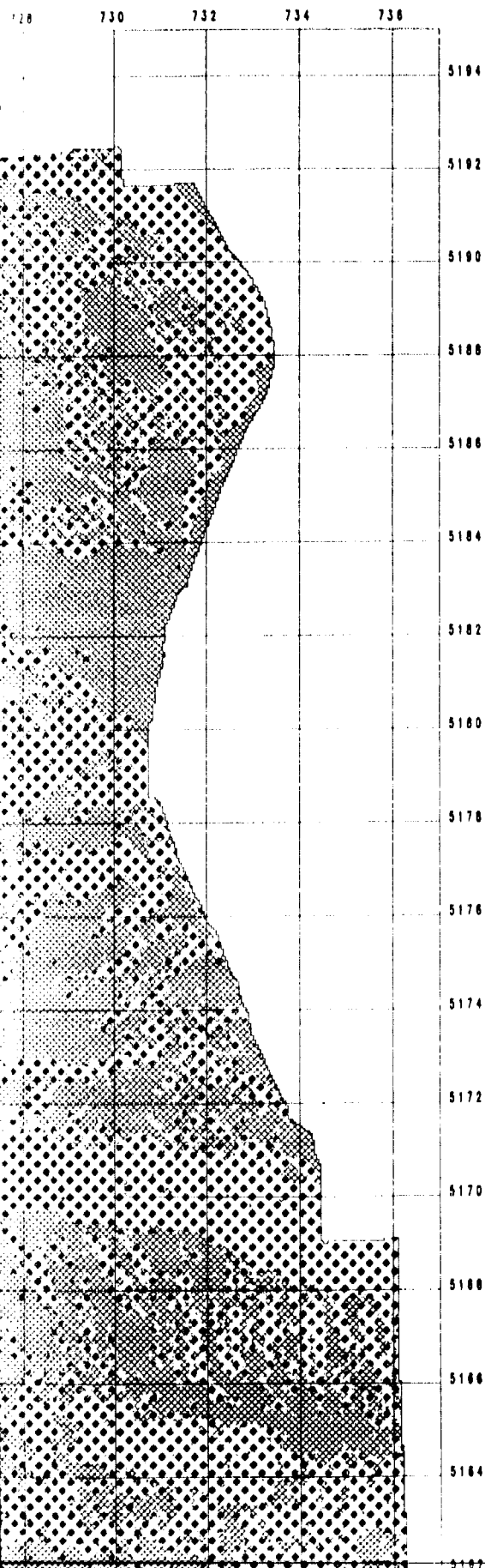
5170

5168

5166

5164

5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12in)
	MINIMUM (0-.5in)		SEVERE (>12in)
	SLIGHT (.5-2in)		URBAN/ OFF LIMITS
	MODERATE (2-5in)		WATER

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

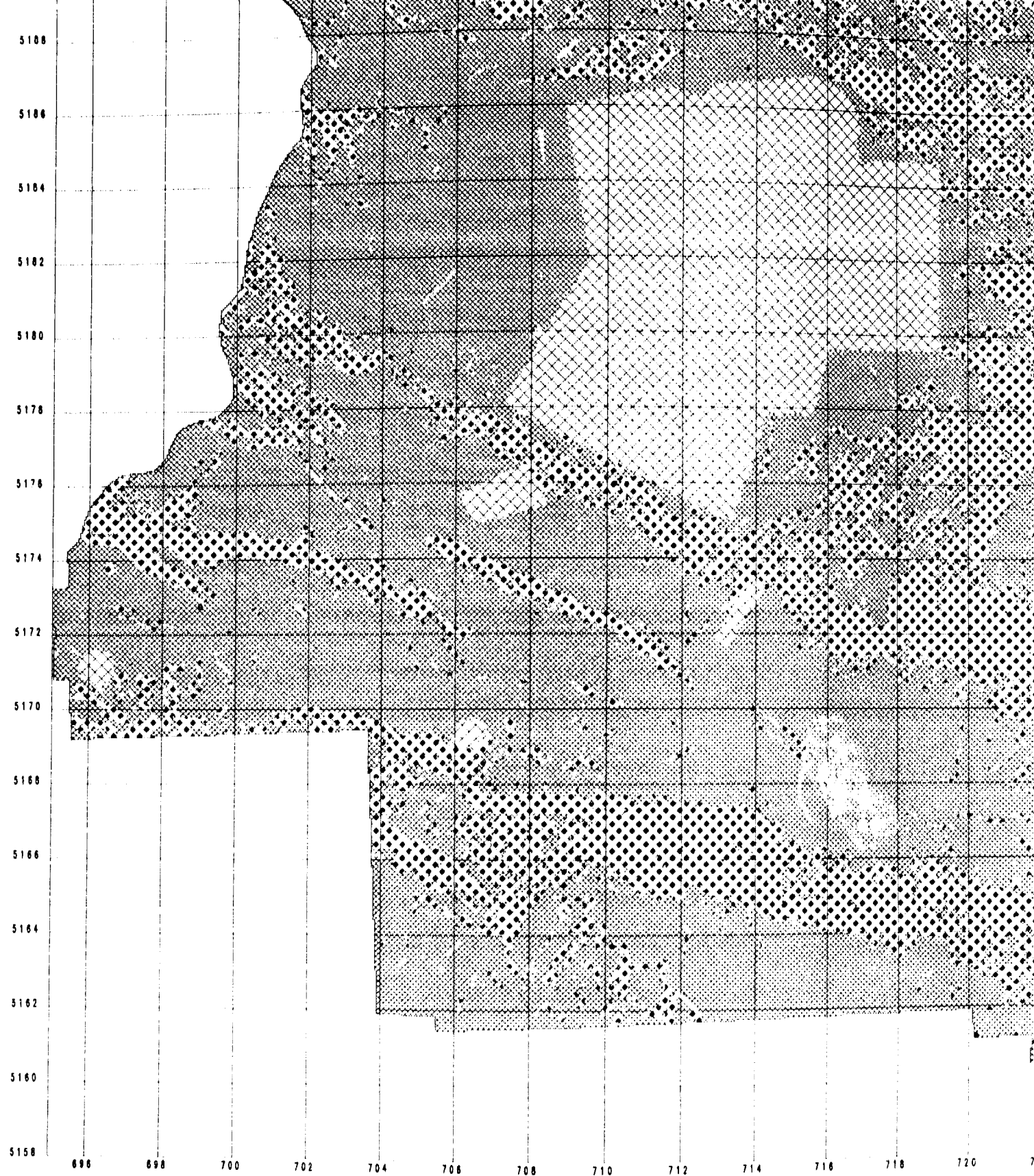


Plate 19. Fifty pass soil disturbance level map for

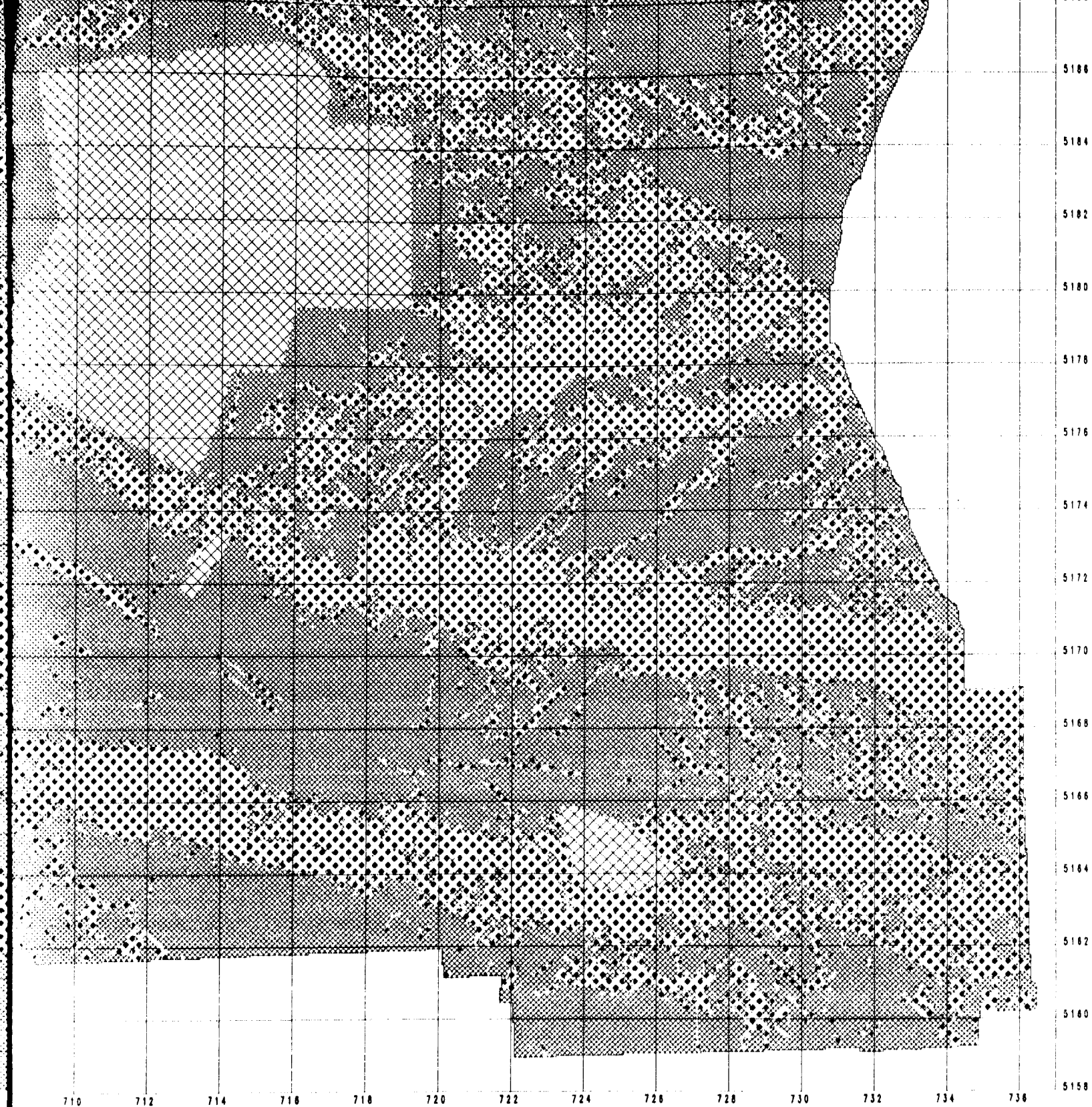
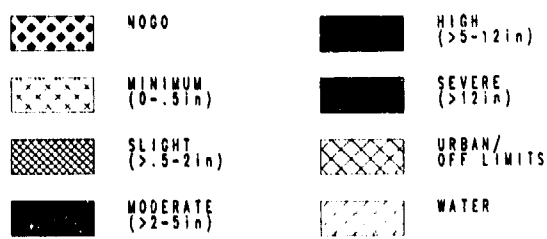
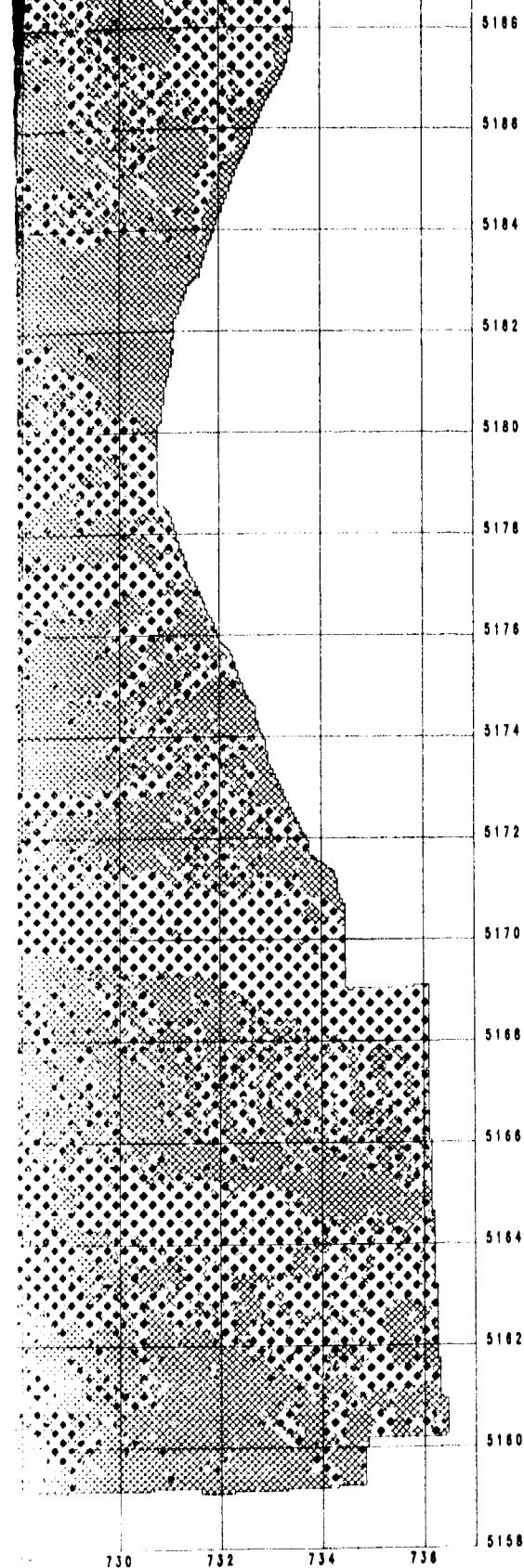
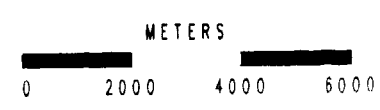


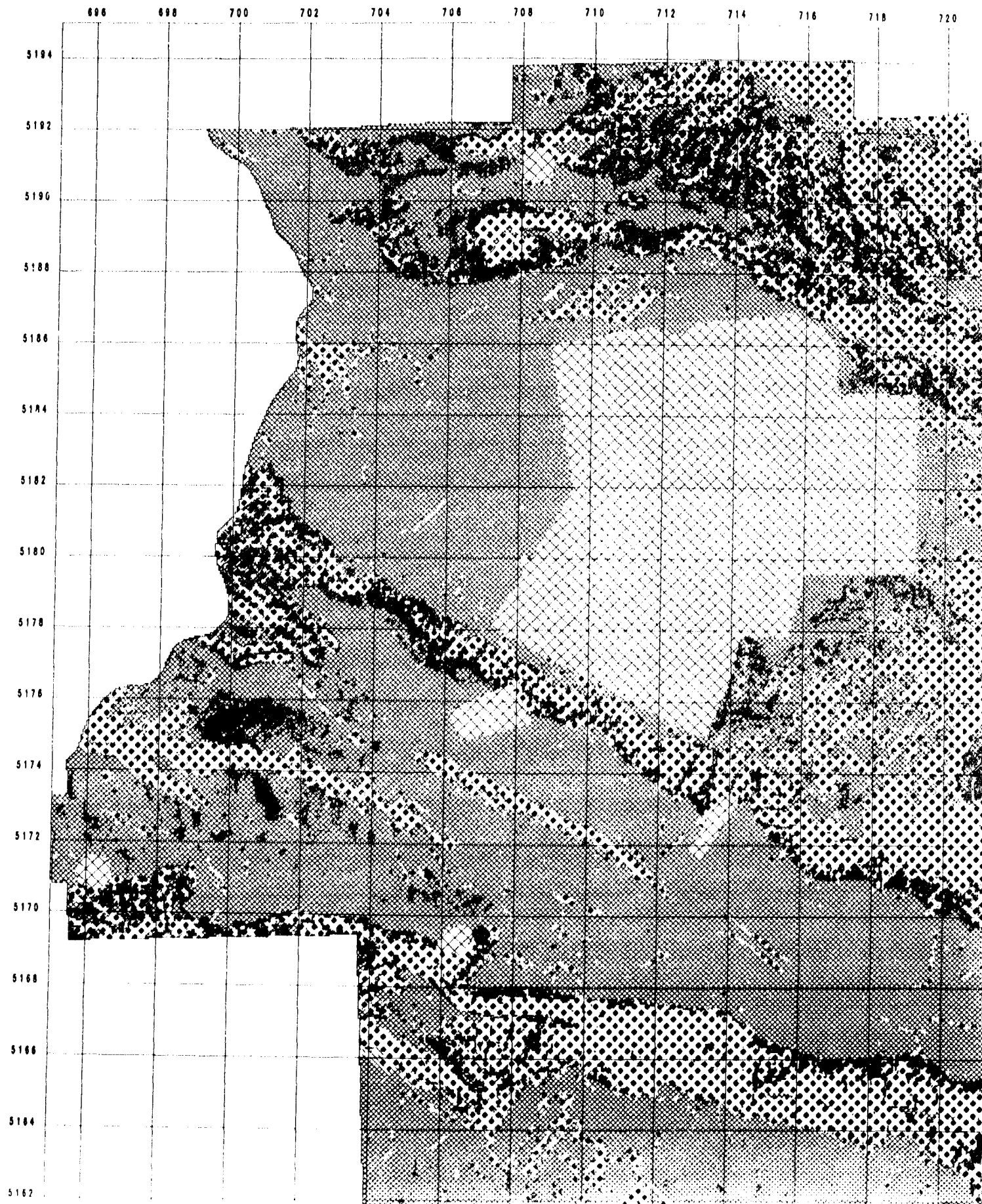
Plate 19. Fifty pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface



YAKIMA FIRING CENTER
 3-3-5 FORCE STRUCTURE
 WET-WET SEASON
 SLIPPERY CONDITION
 50 PASSES



Force structures in the wet-wet slippery surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

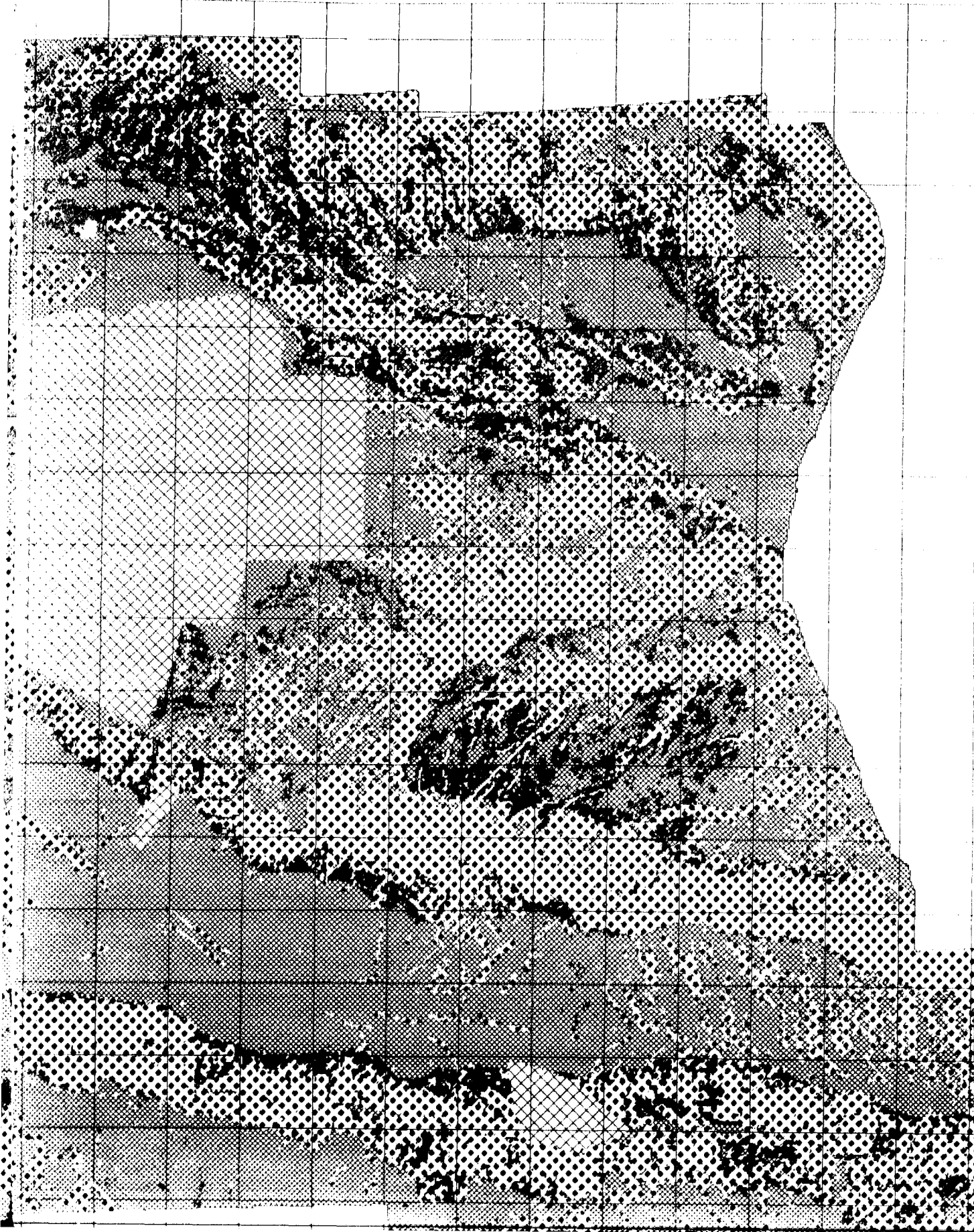
5170

5168

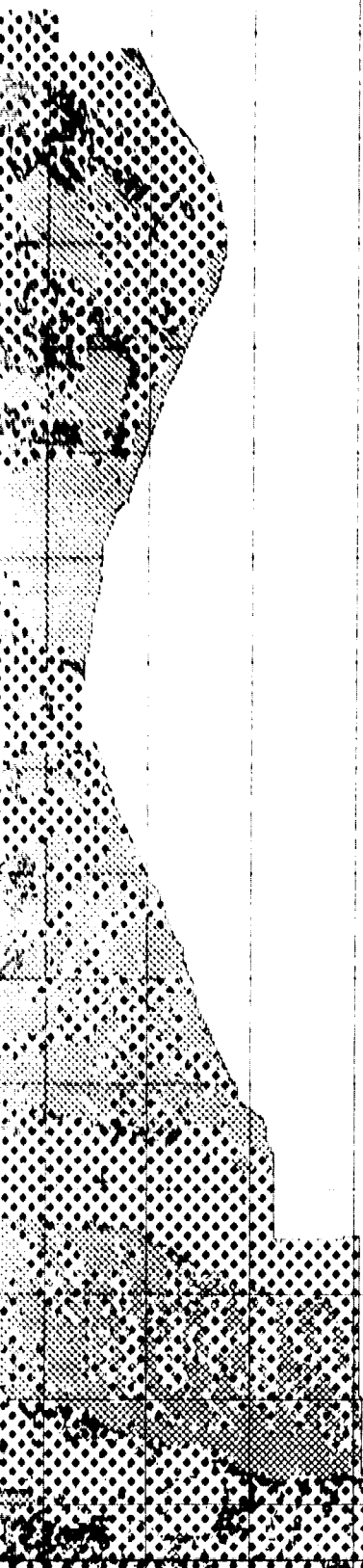
5166

5164

5162



730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164

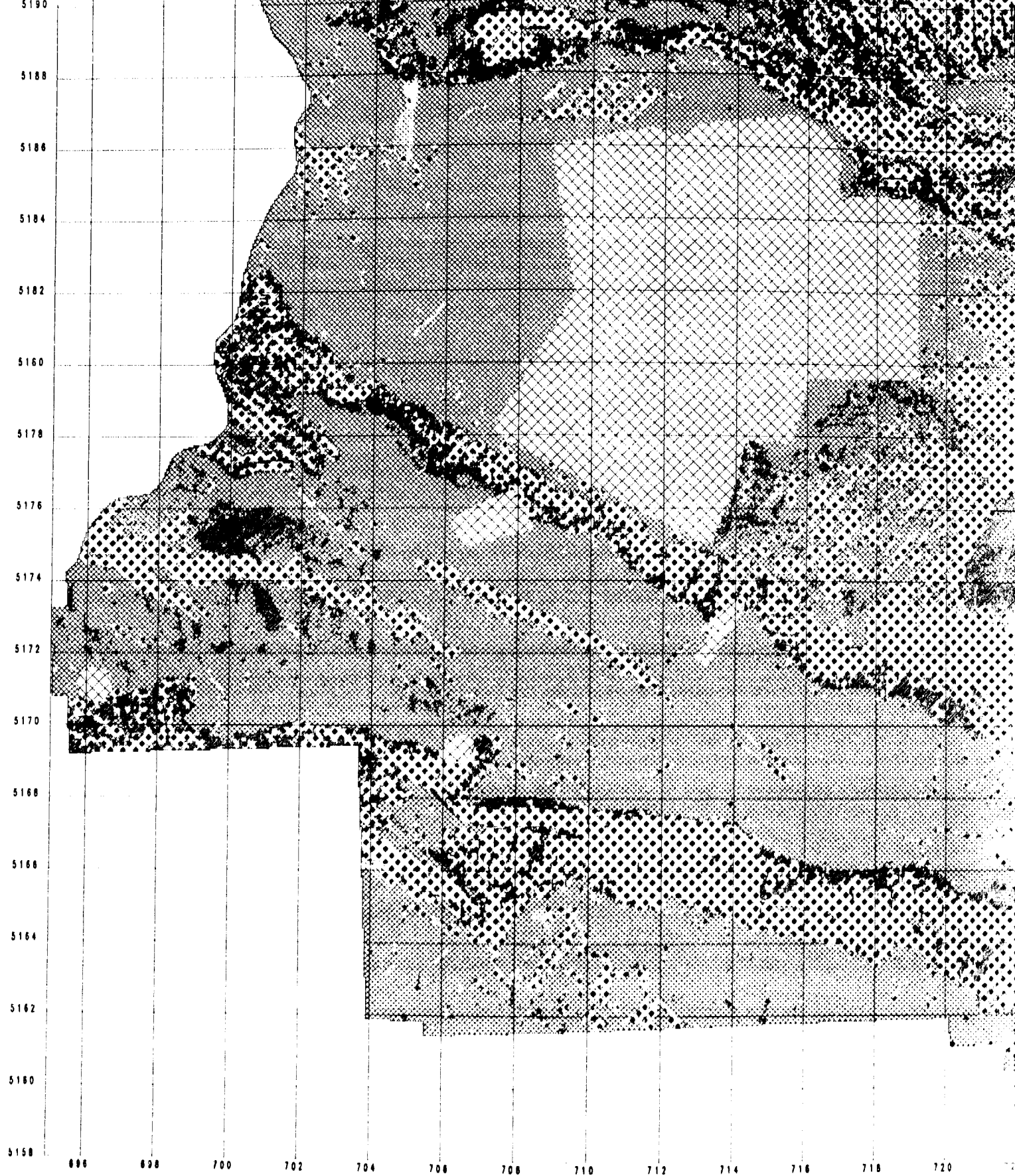
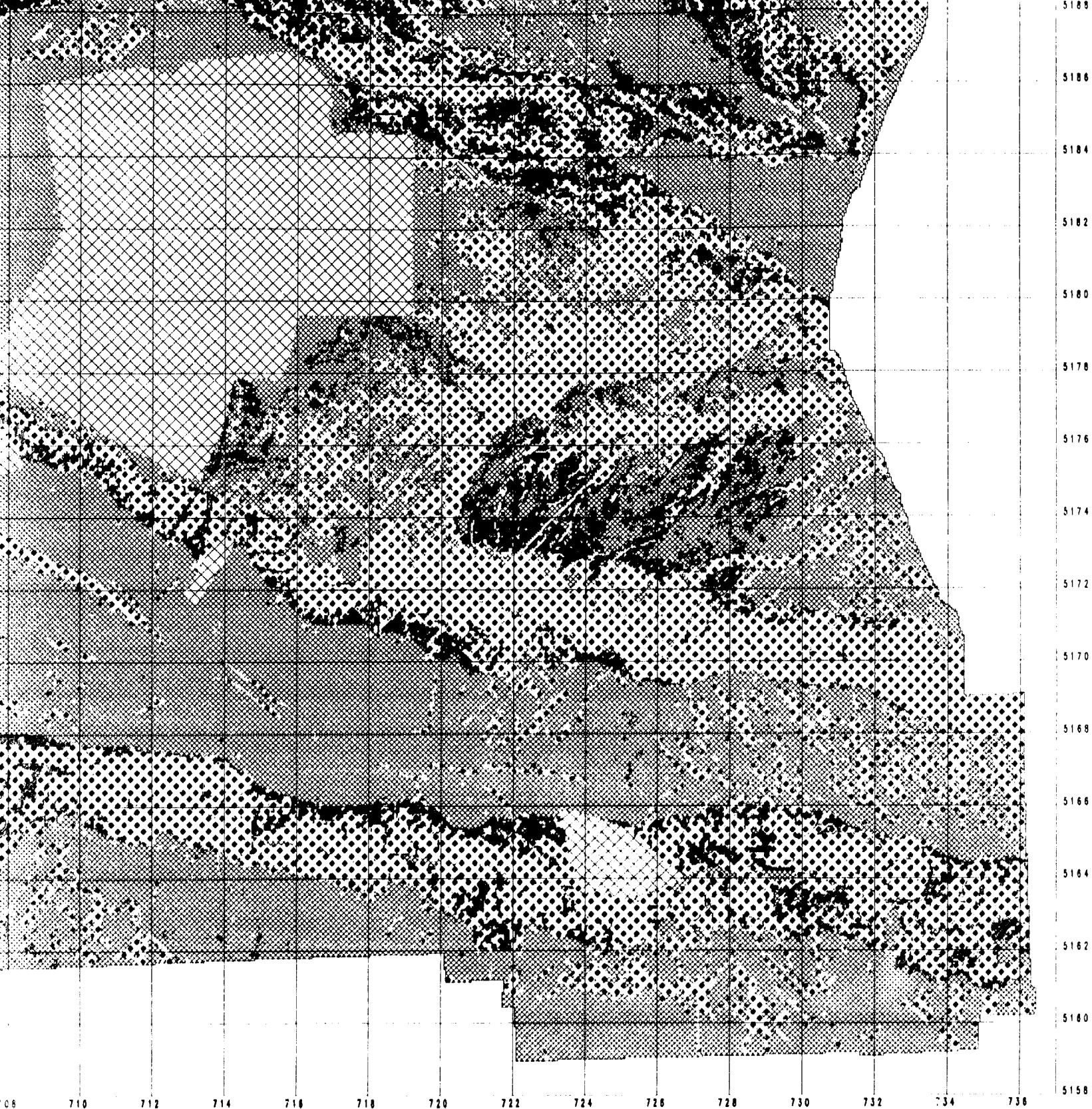
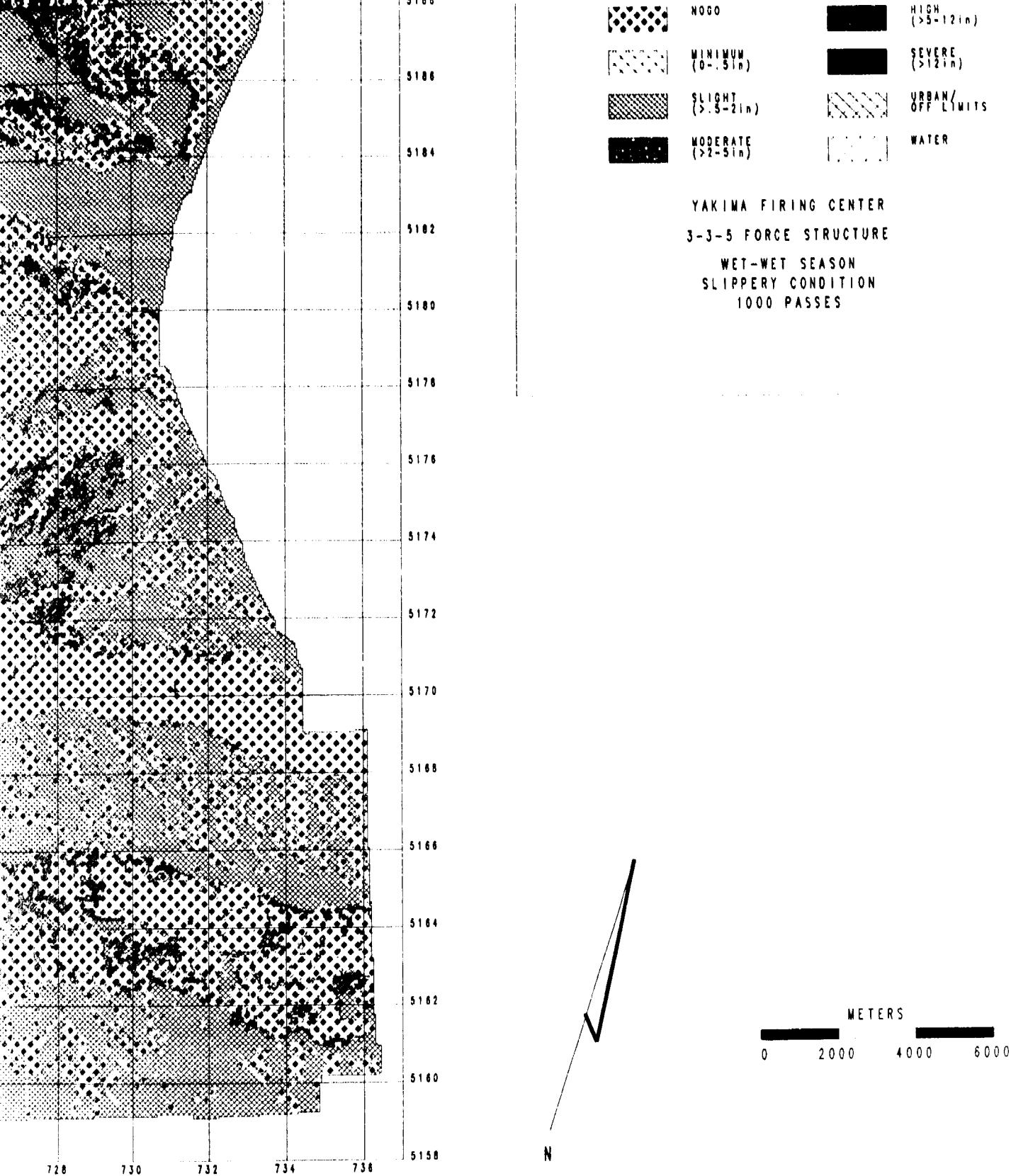


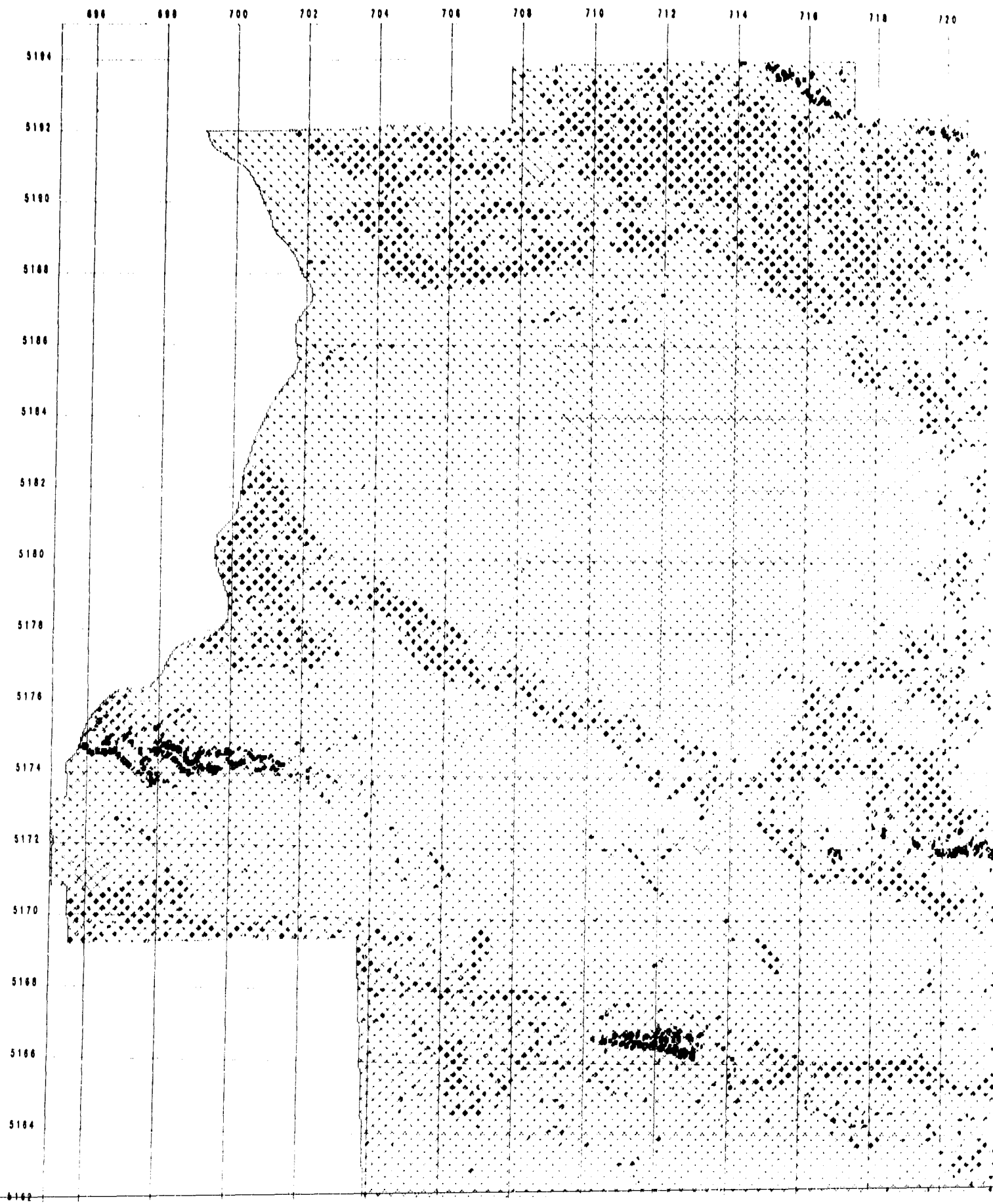
Plate 20. One thousand pass soil disturbance level map for

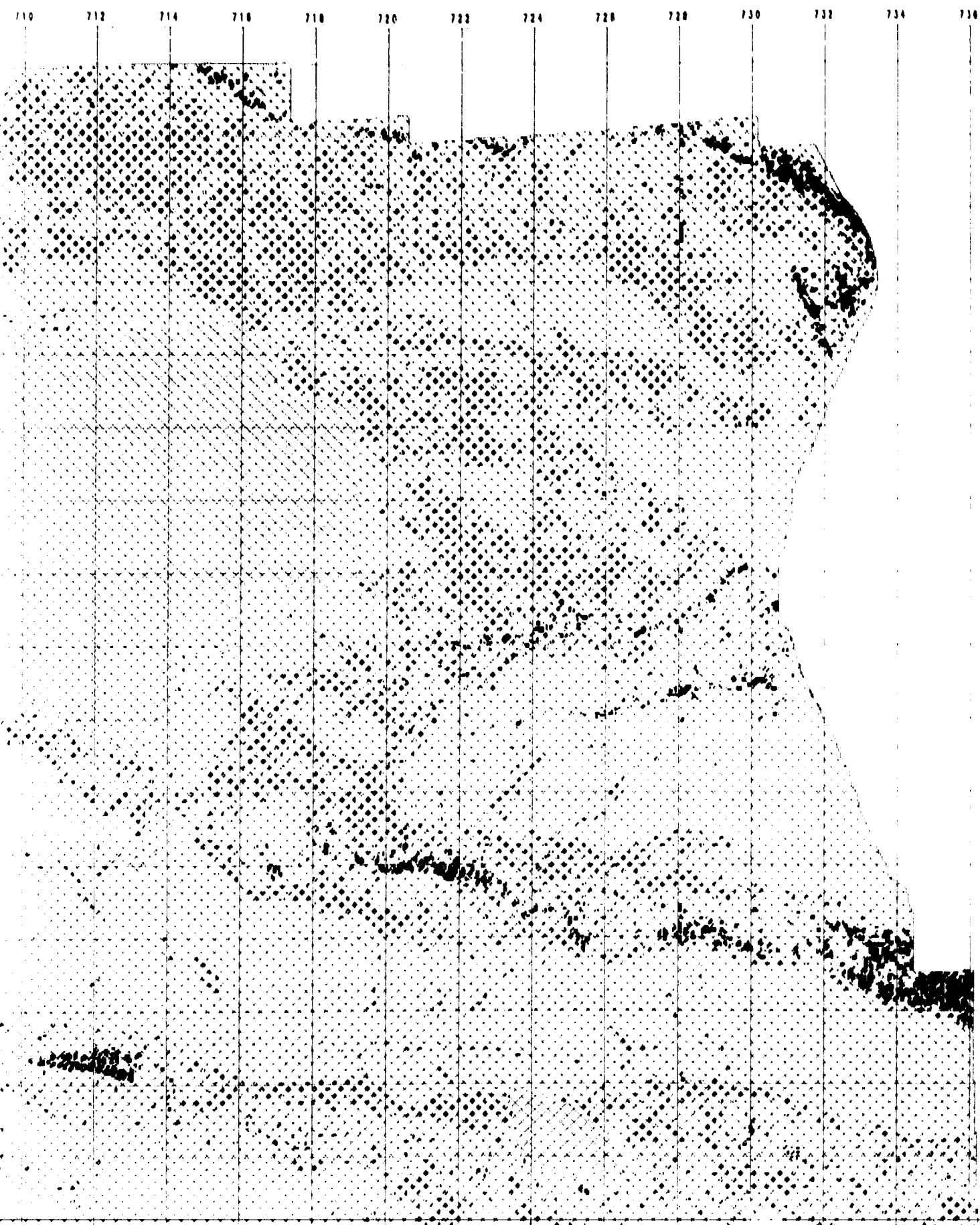


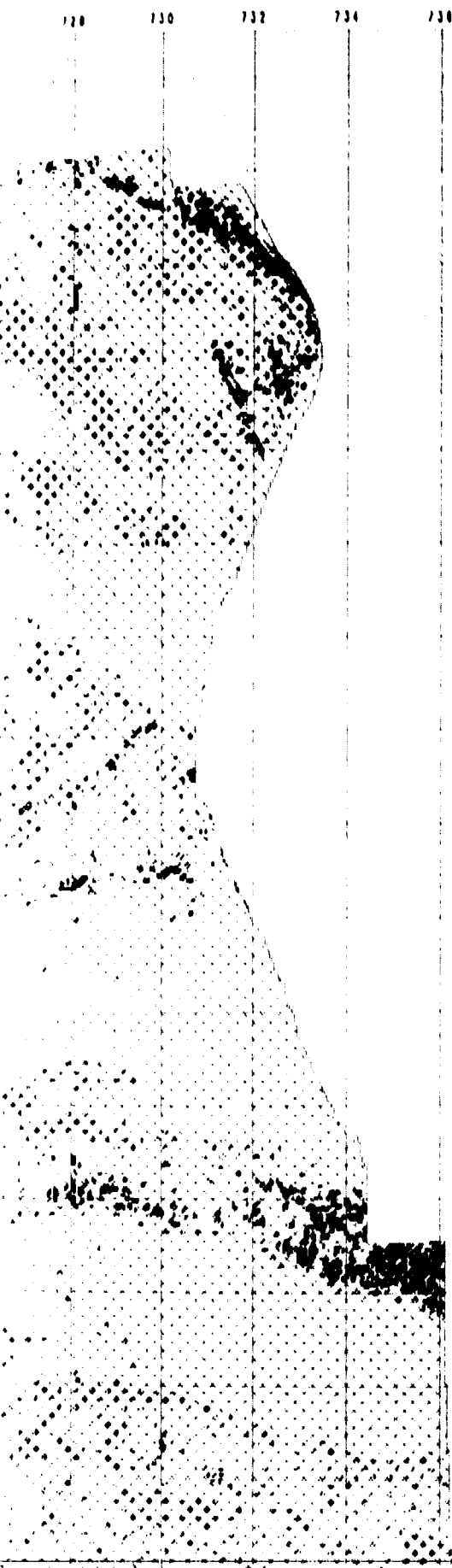
ate 20. One thousand pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface



(HMMWV) force structures in the wet-wet slippery surface condition







5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS
SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

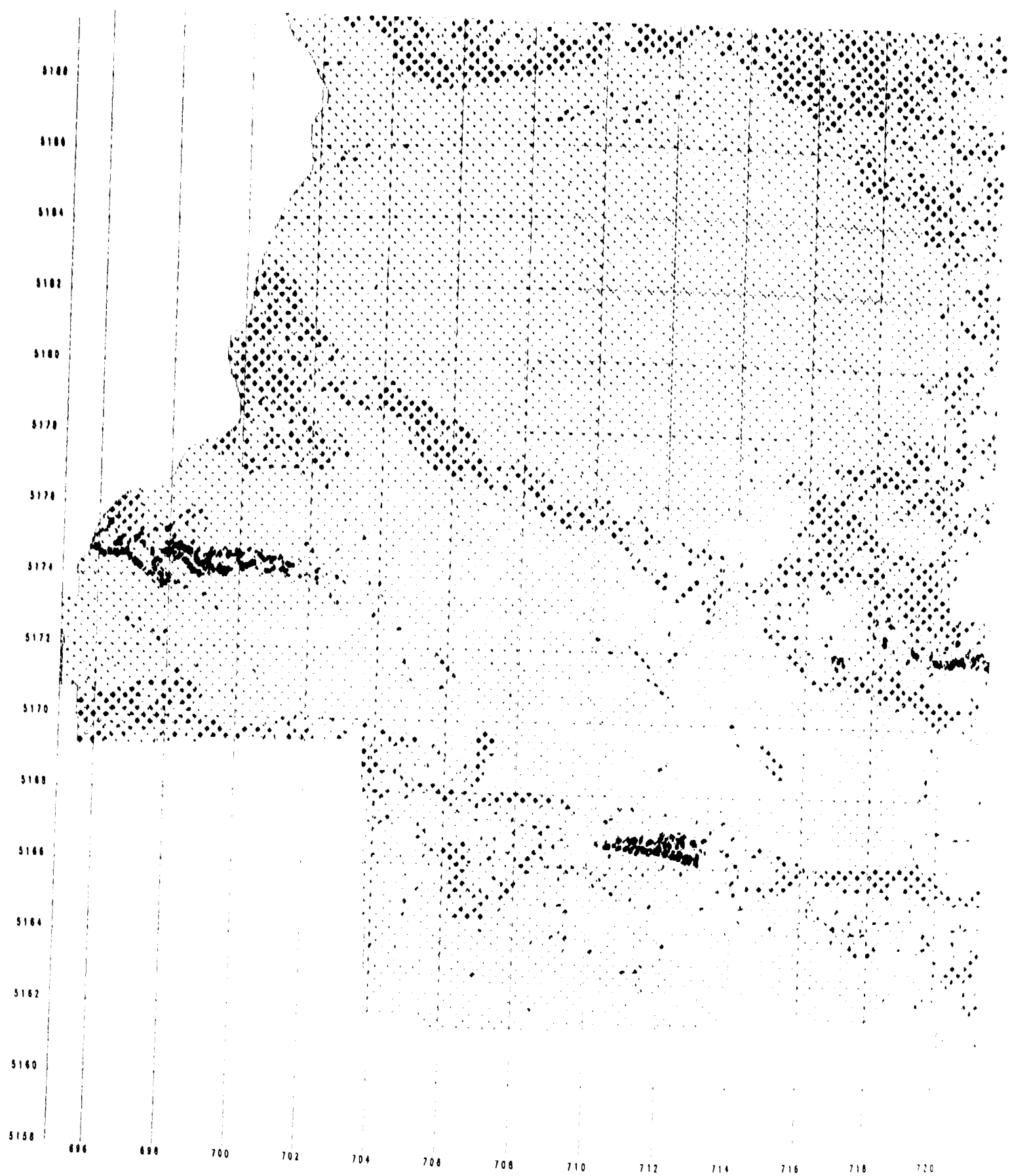


Plate 21. Ten pass soil disturbance level map

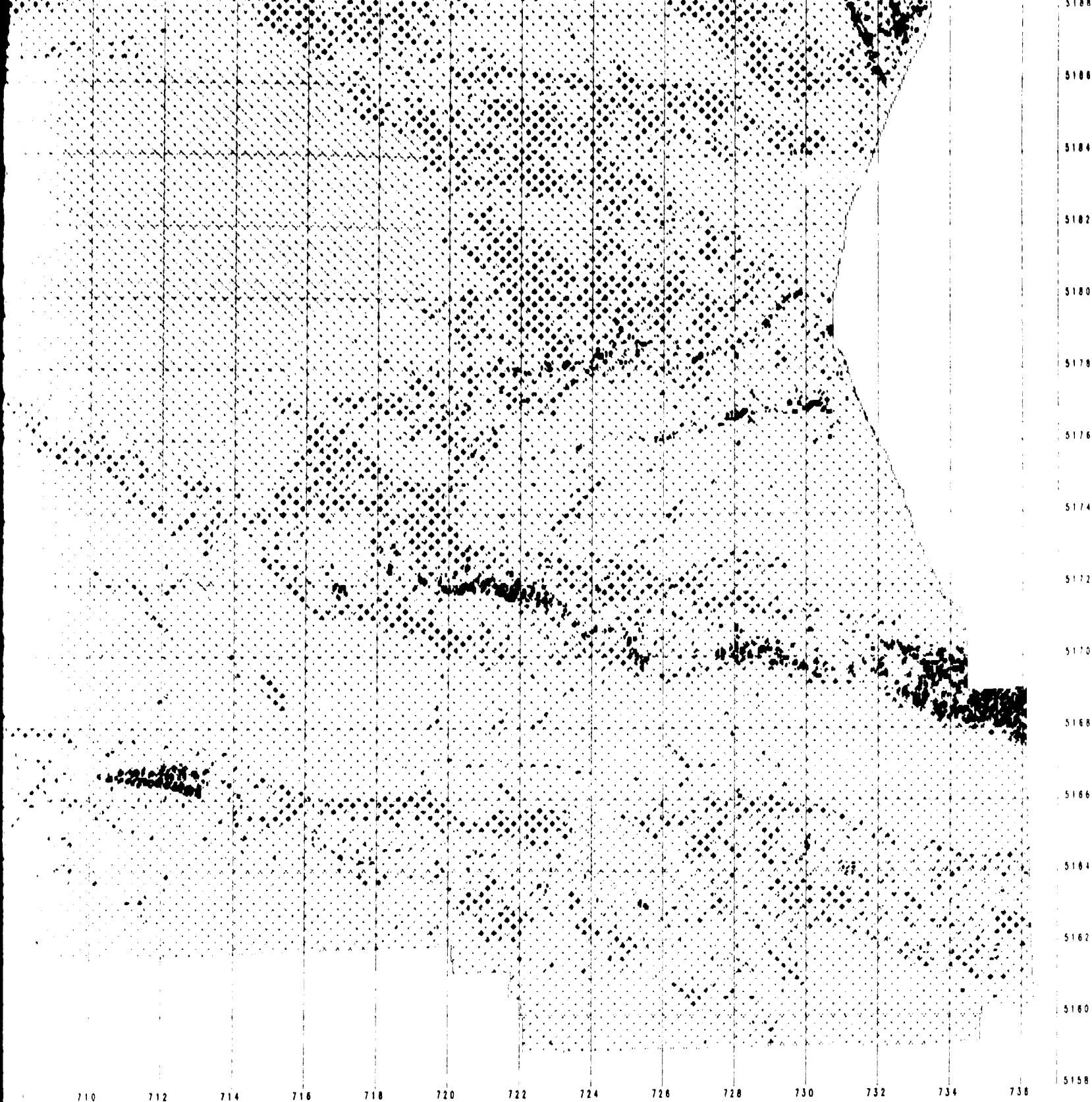
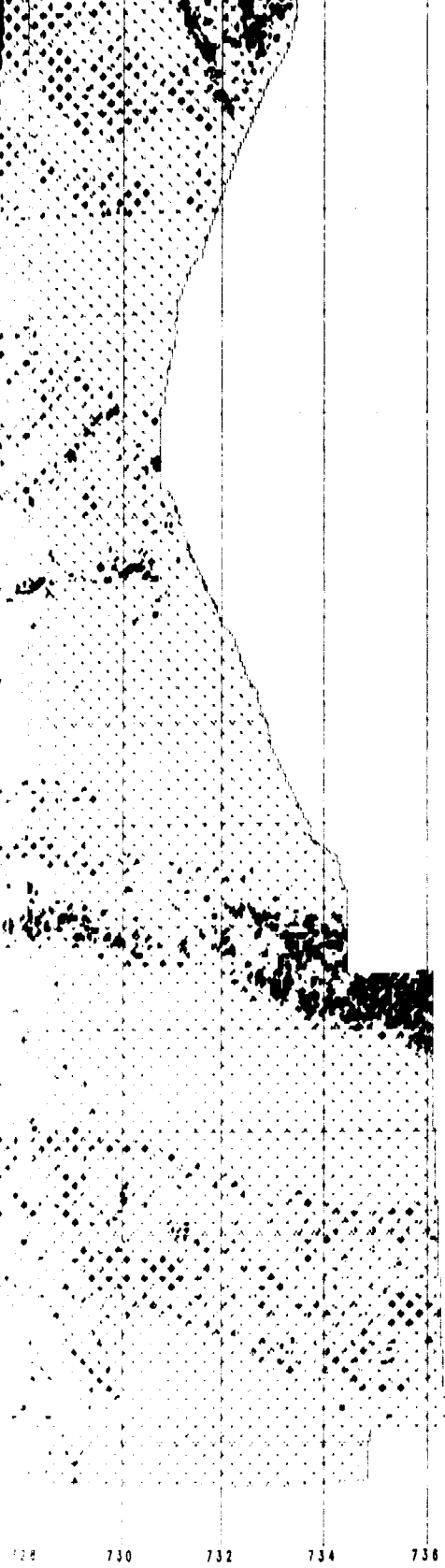
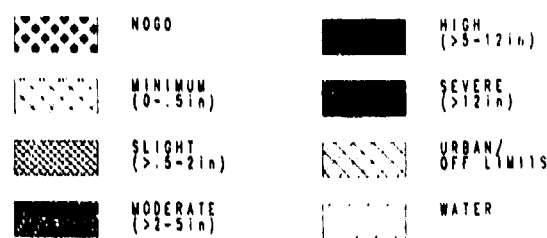


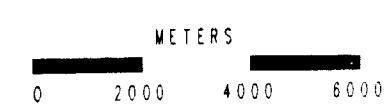
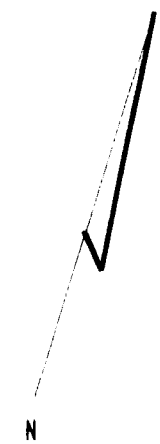
Plate 21. Ten pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface condition



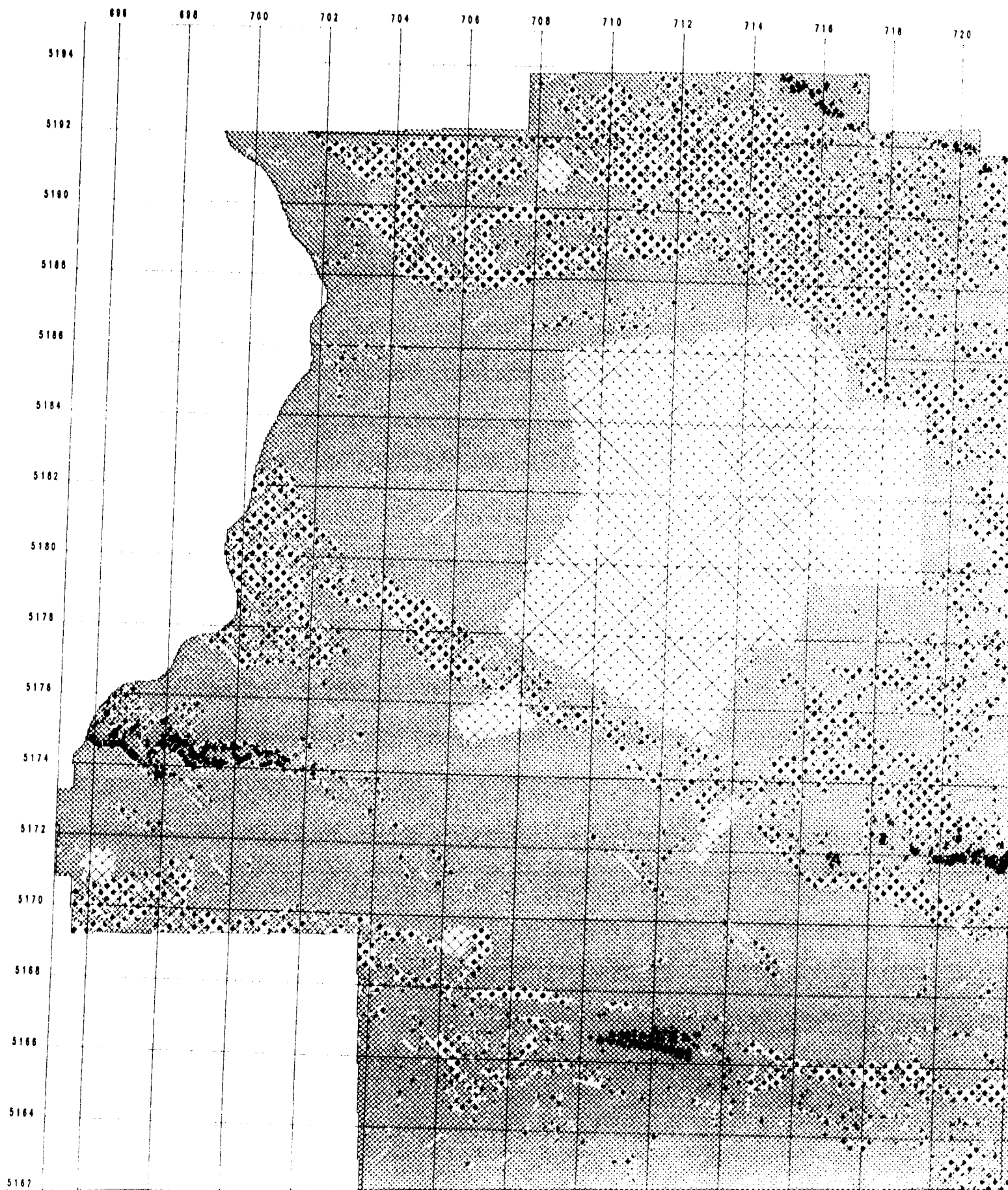
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160
5158



YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES



ce structure in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

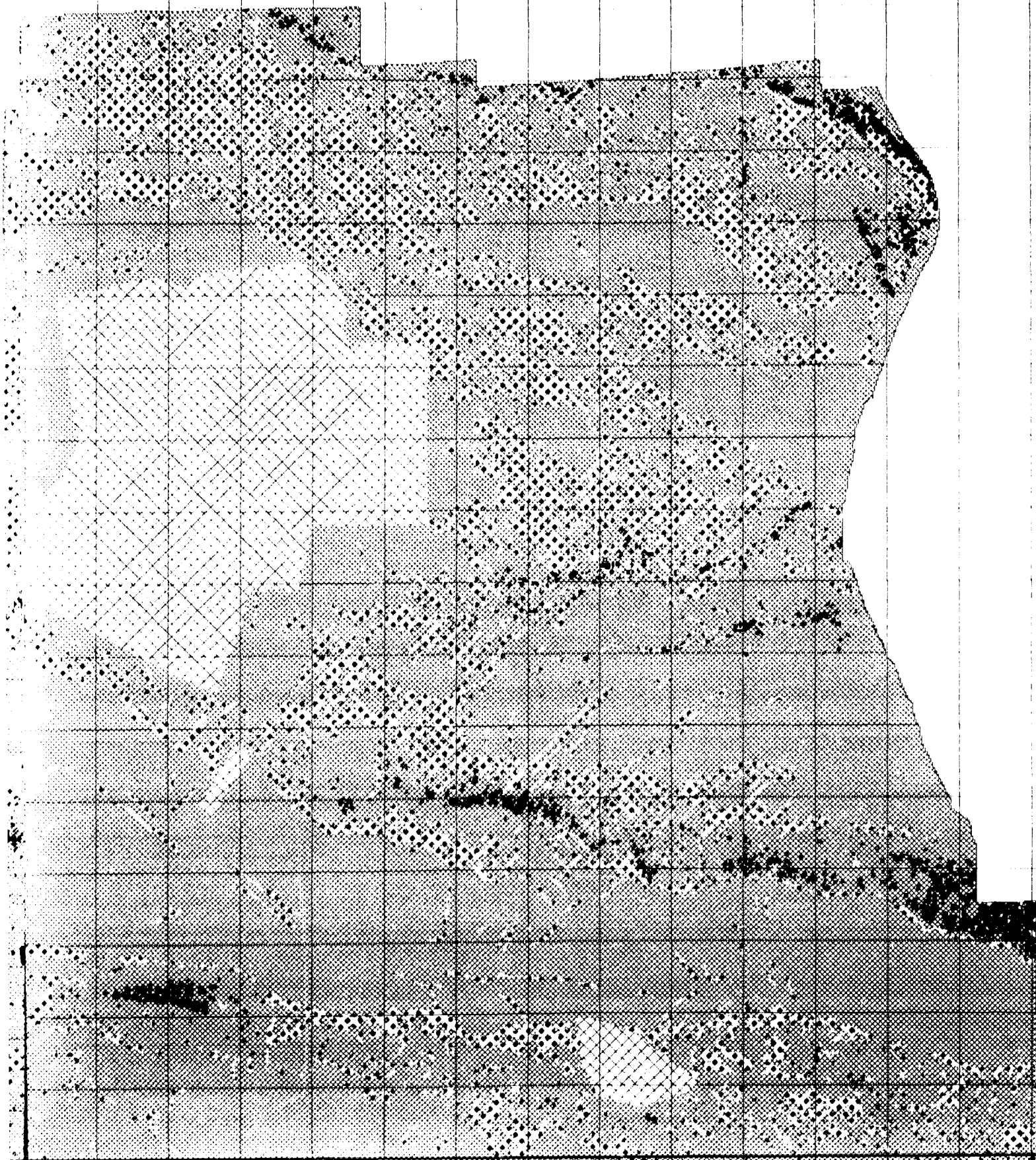
5170

5168

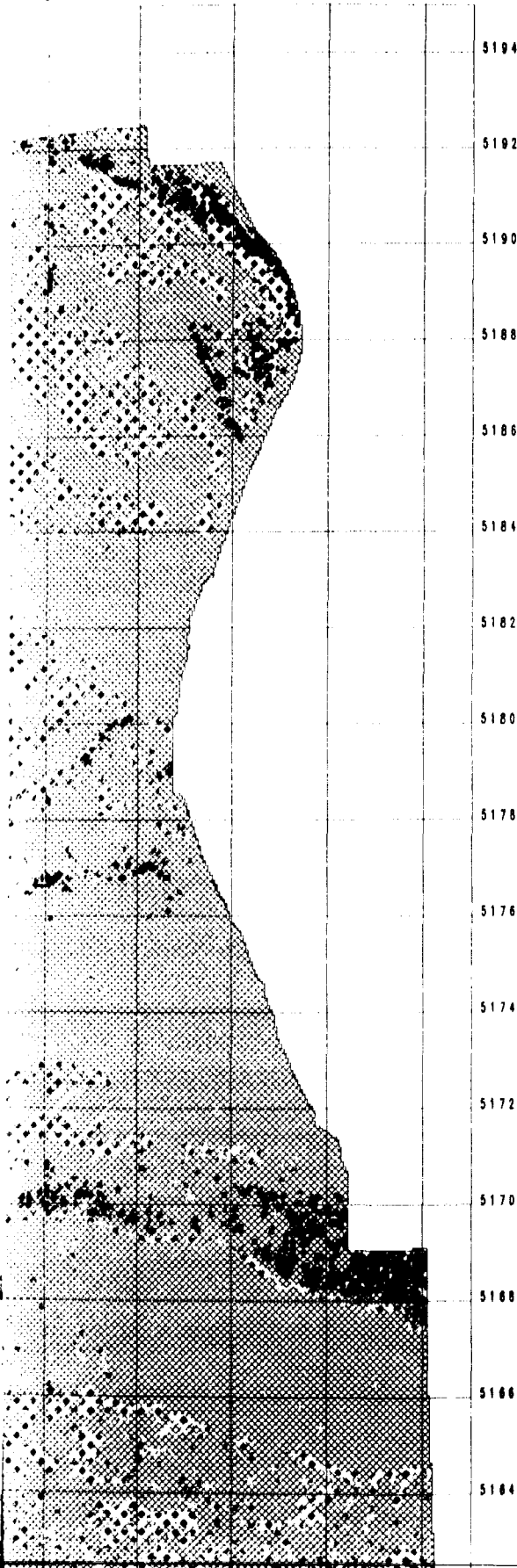
5166

5164

5162



728 730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (>.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (>2-5 in)		WATER

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

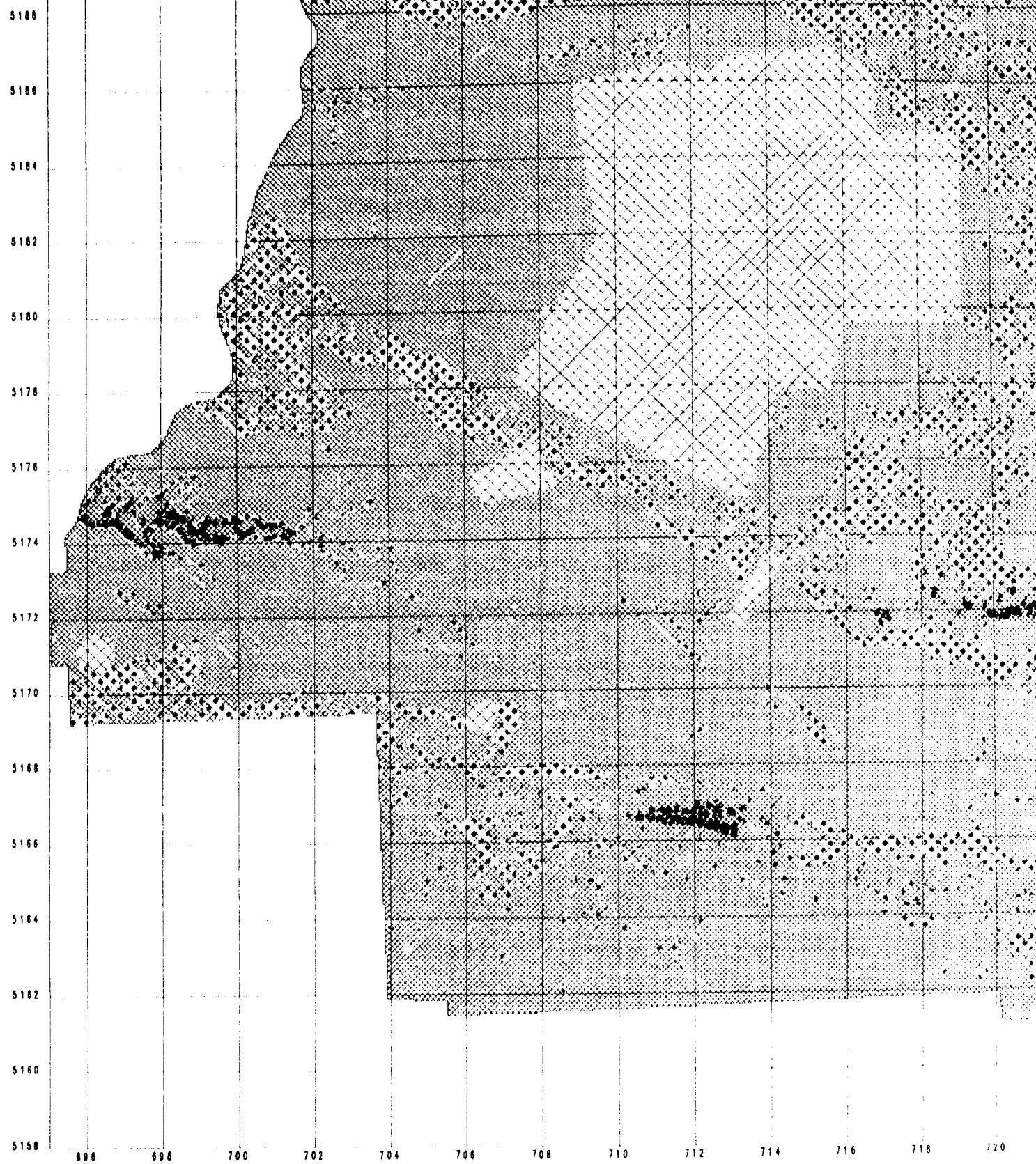


Plate 22. Fifty pass soil disturbance level

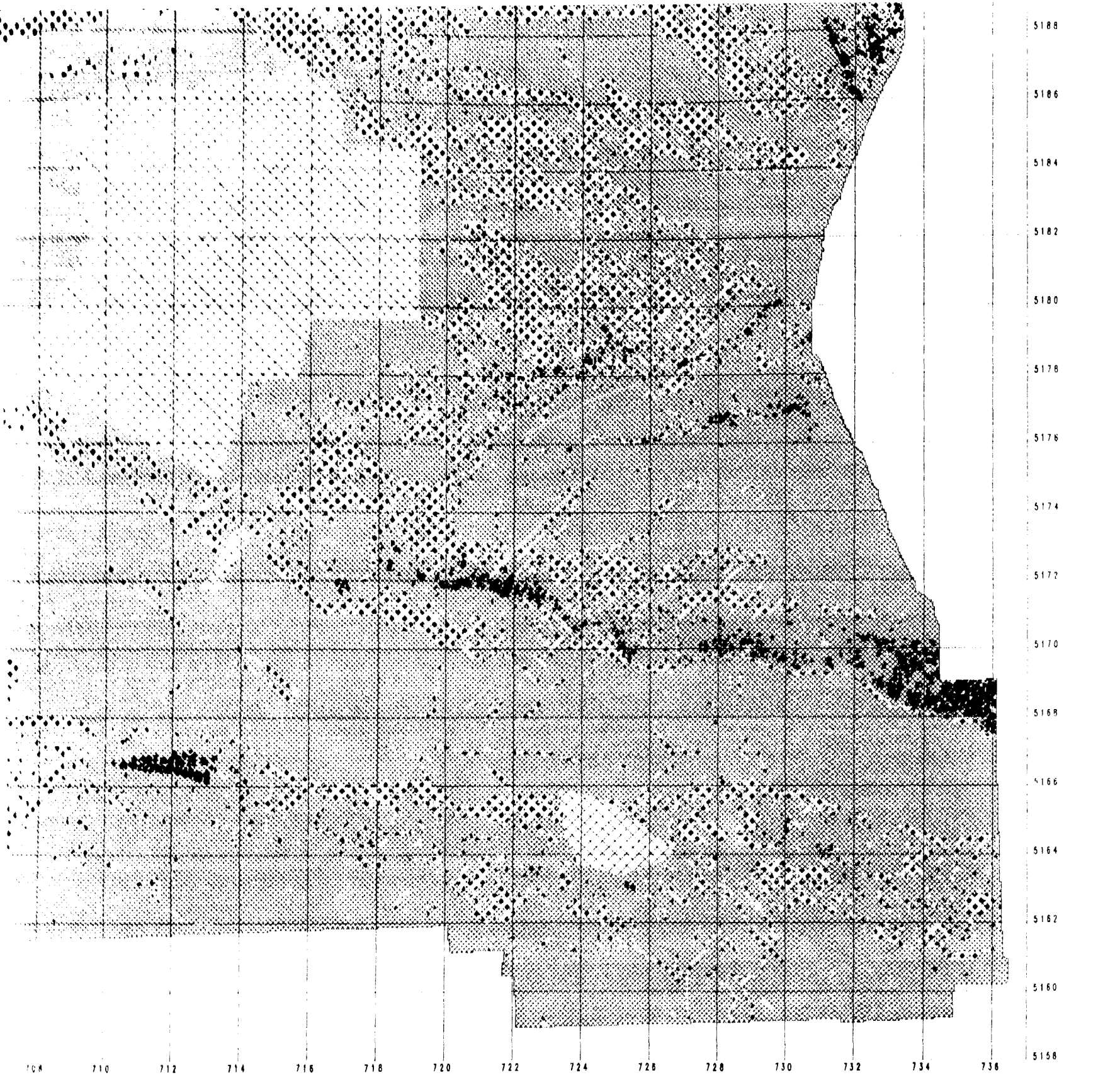
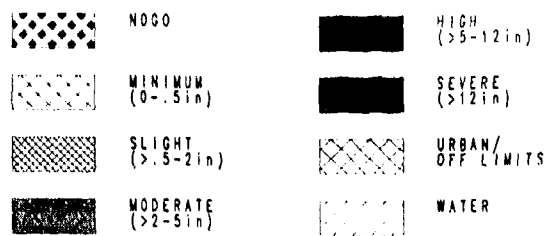
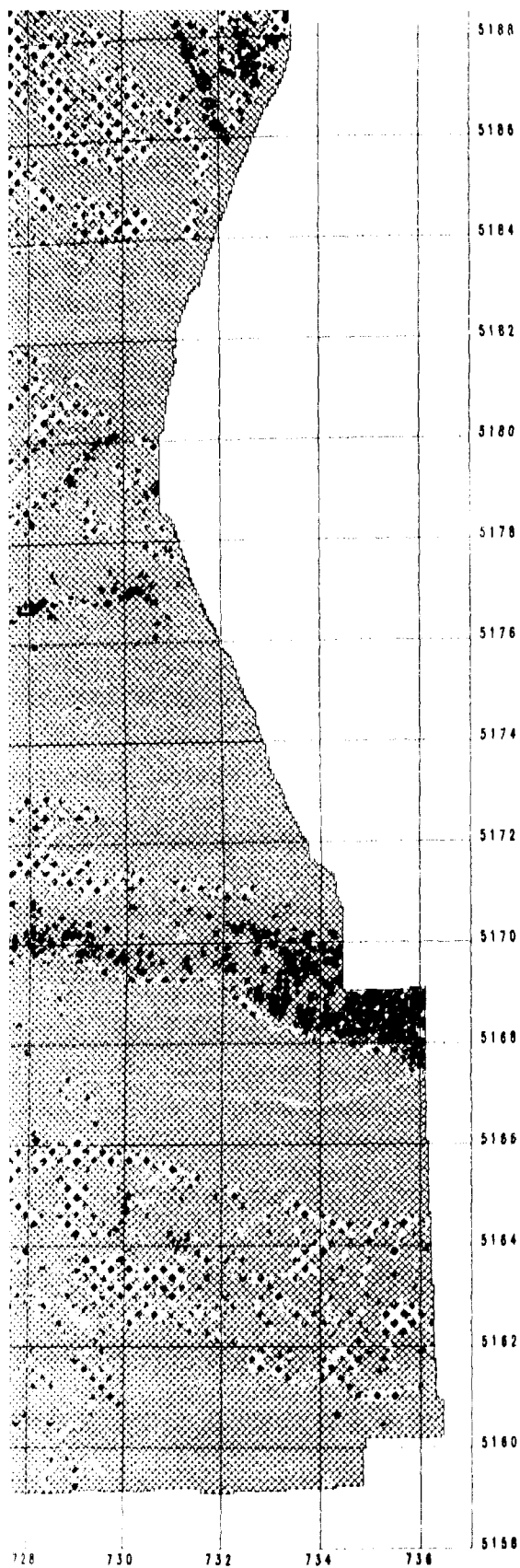
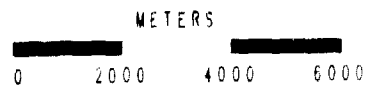


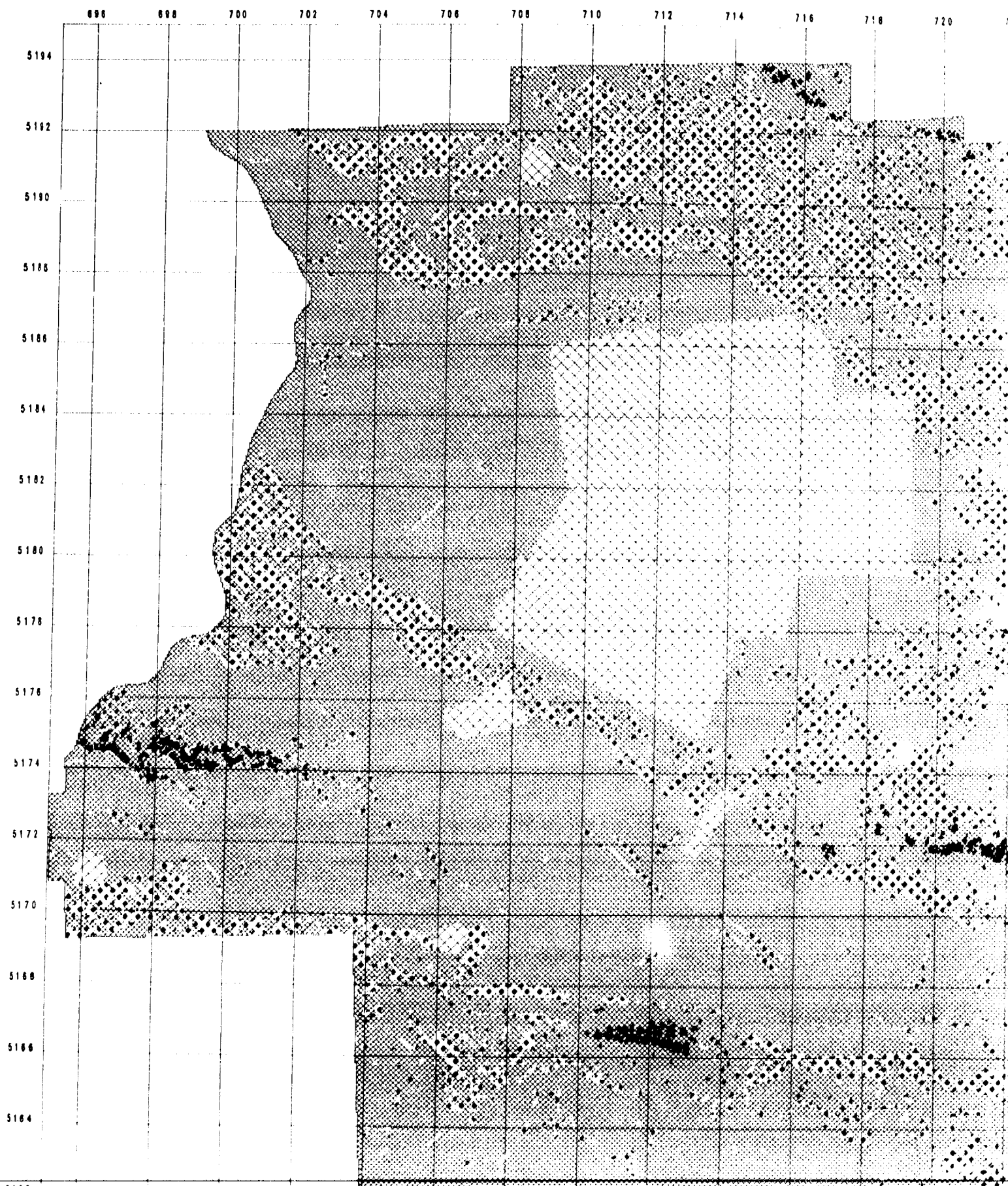
Plate 22. Fifty pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface condition.



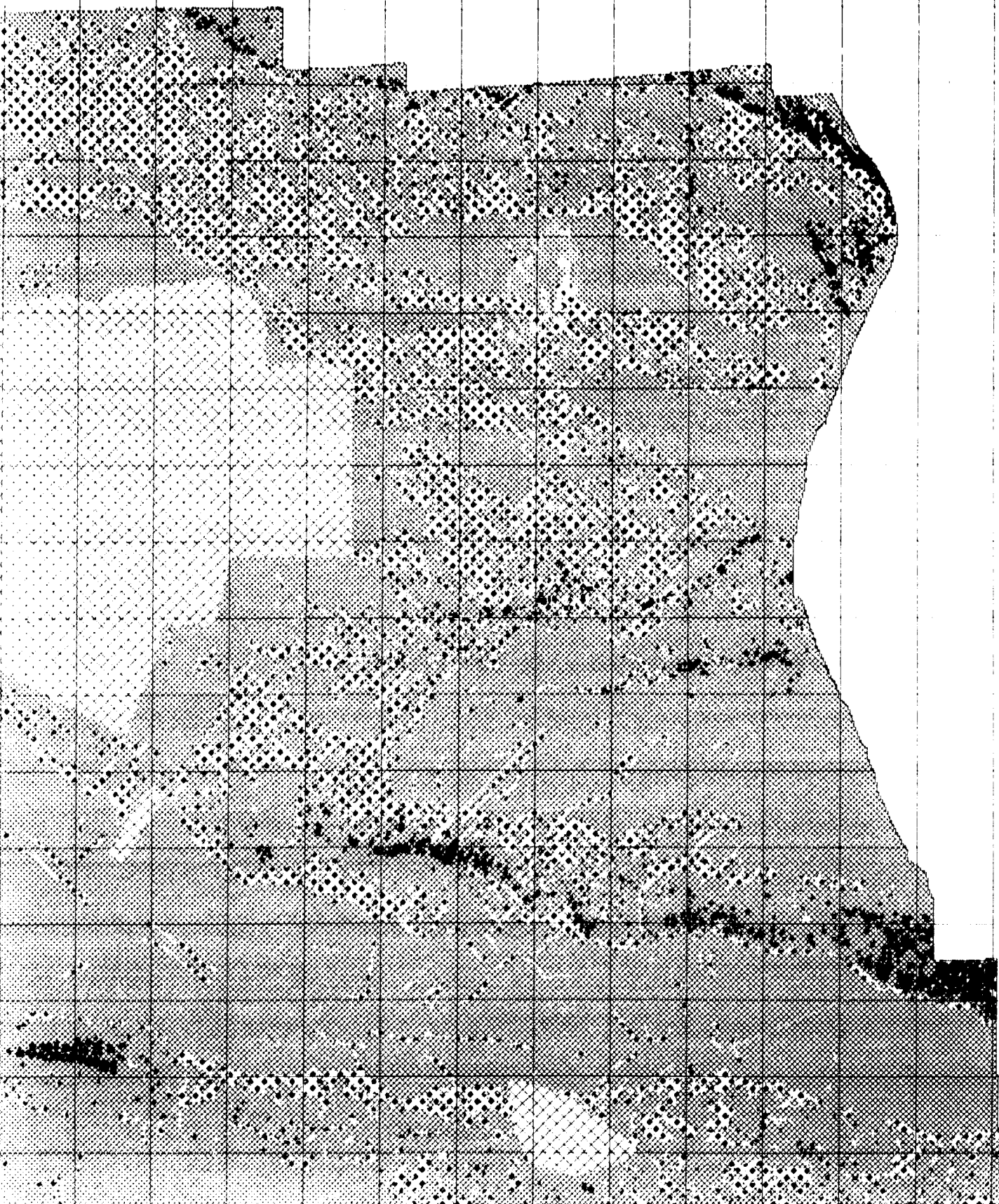
YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES



orce structure in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736



5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

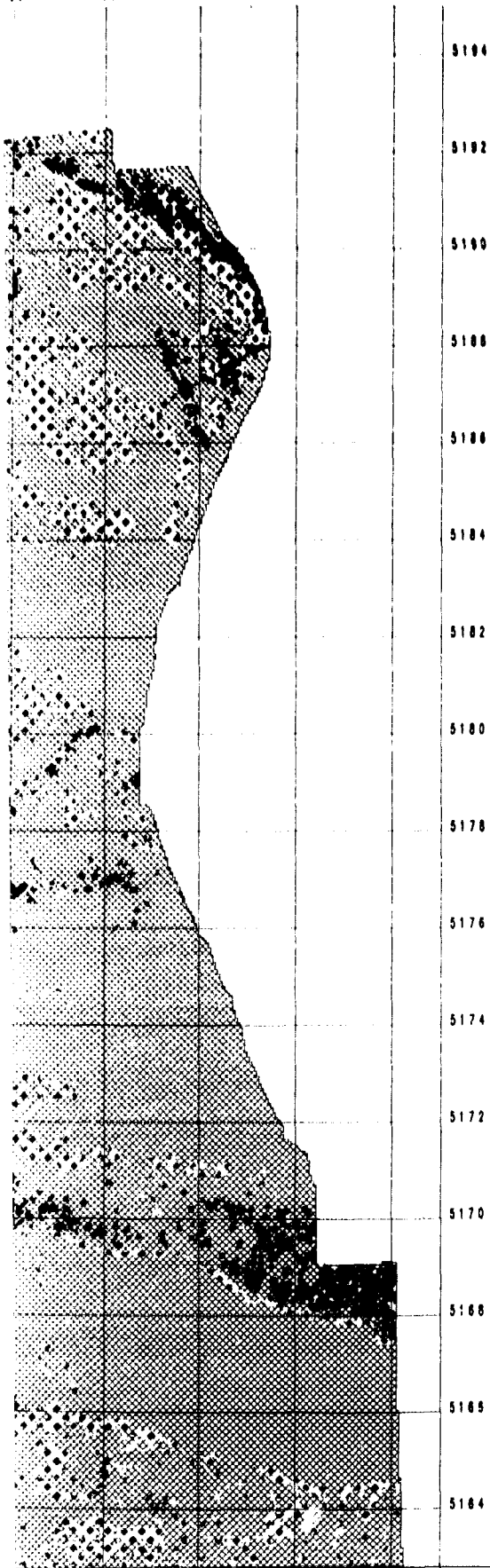
5168

5166

5164



728 730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS
SCALE 1:100000

	NOGO		HIGH (5-12 in)
	MINIMUM (0-1 in)		SEVERE (12 in+)
	SLIGHT (1-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

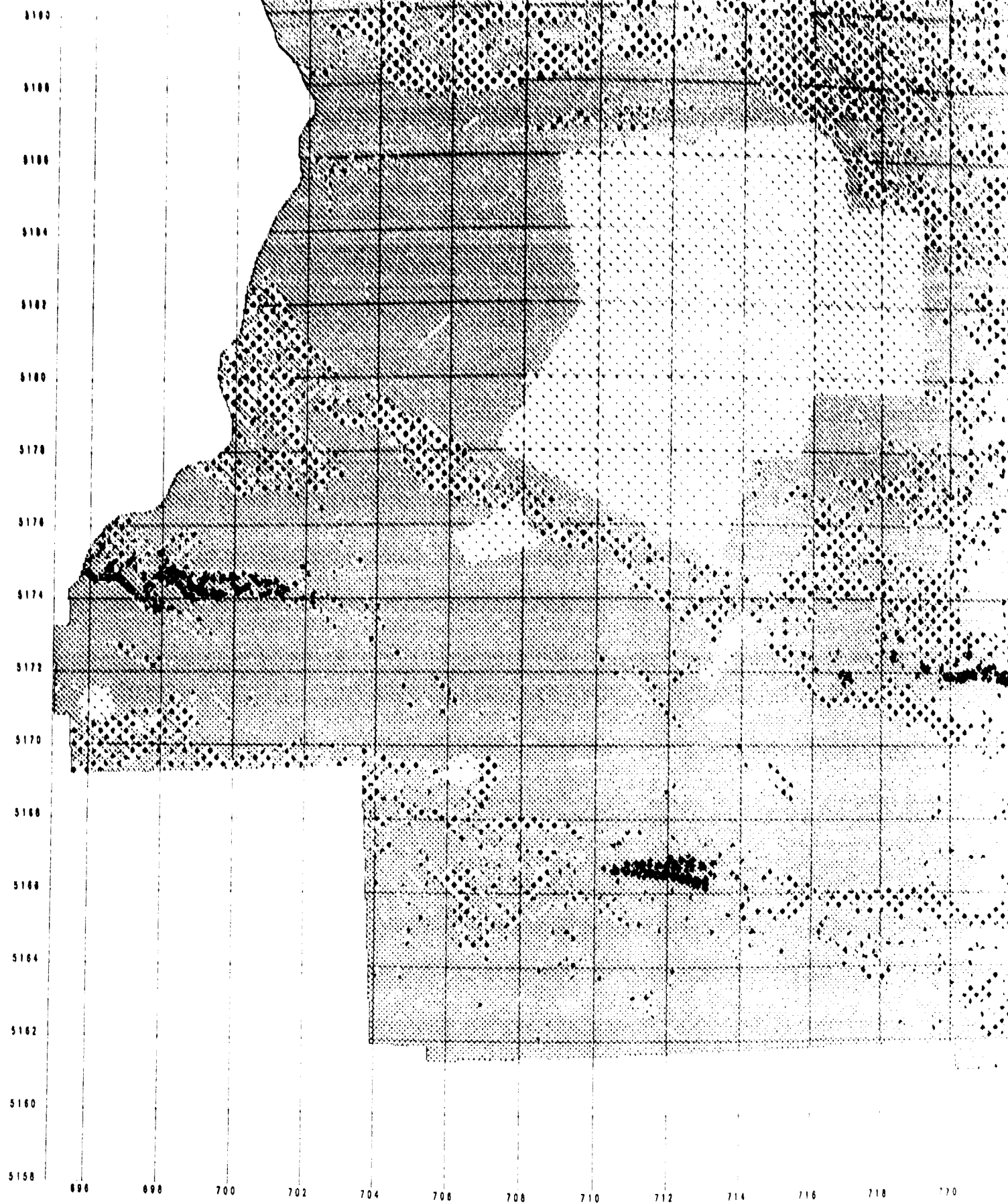


Plate 23. One thousand pass soil disturbance level map

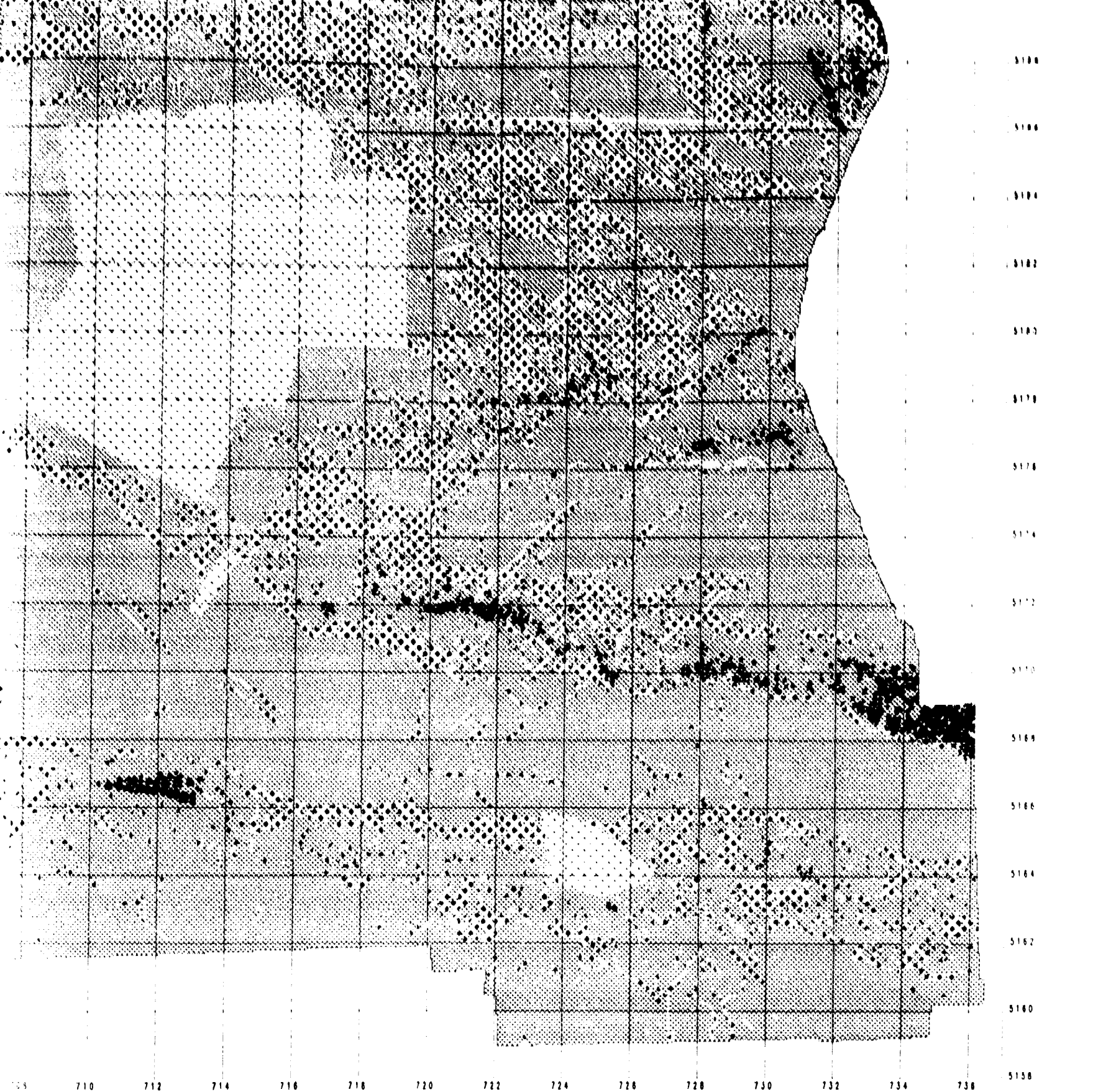
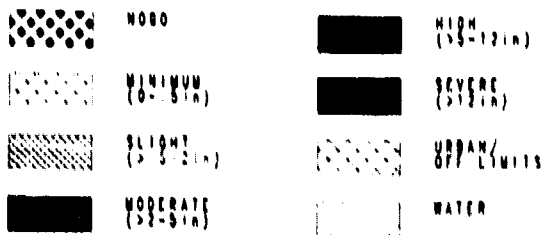
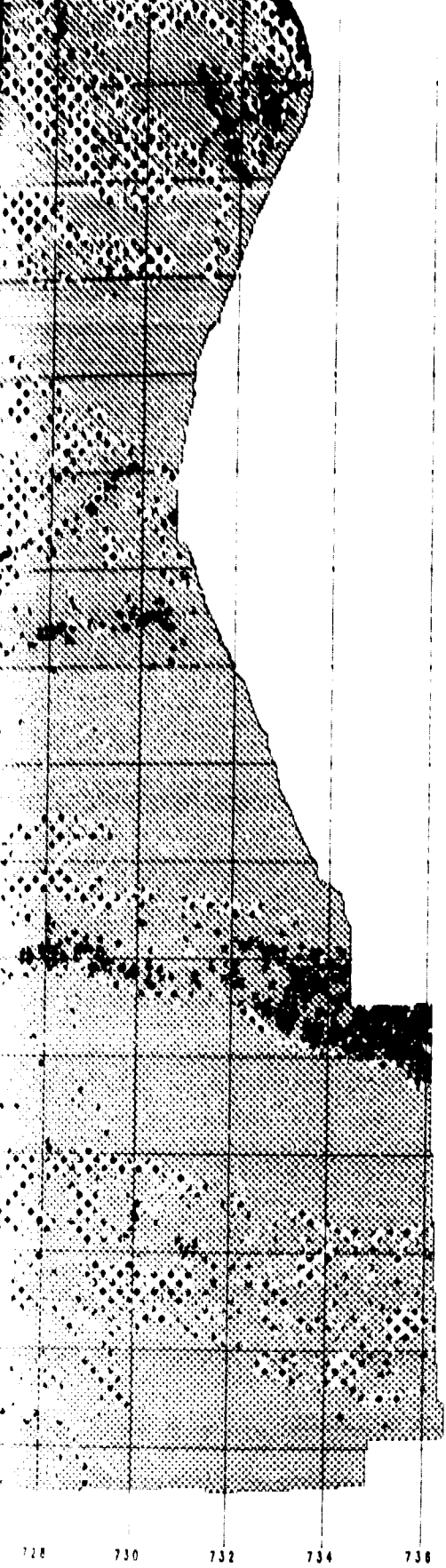


Plate 23. One thousand pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface condition.

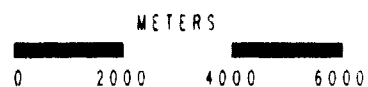
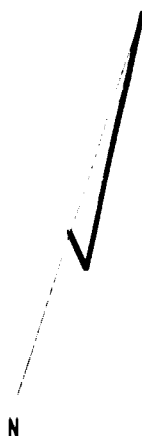
SOIL DISTURBANCE LEVELS

SCALE 1:100000

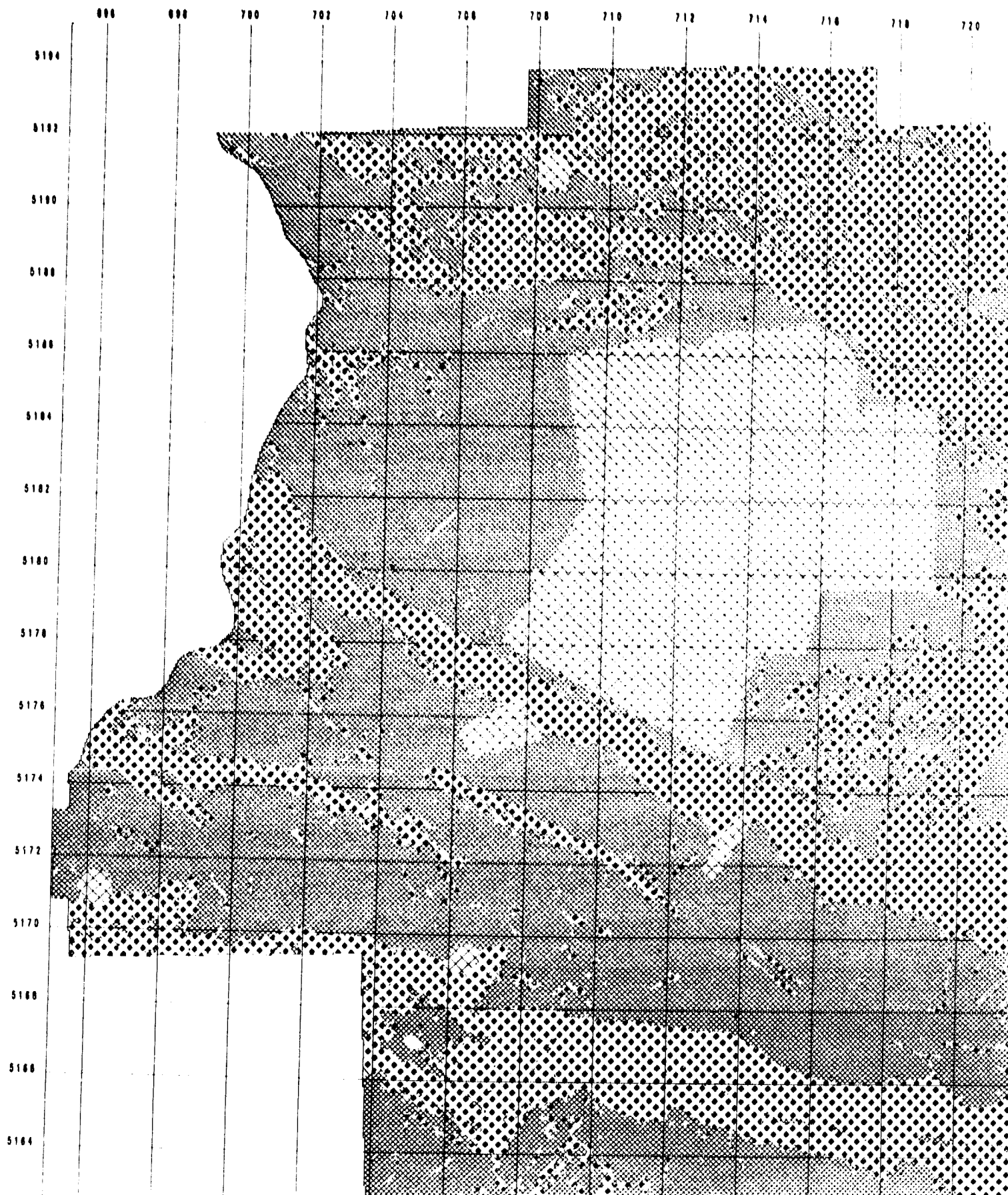


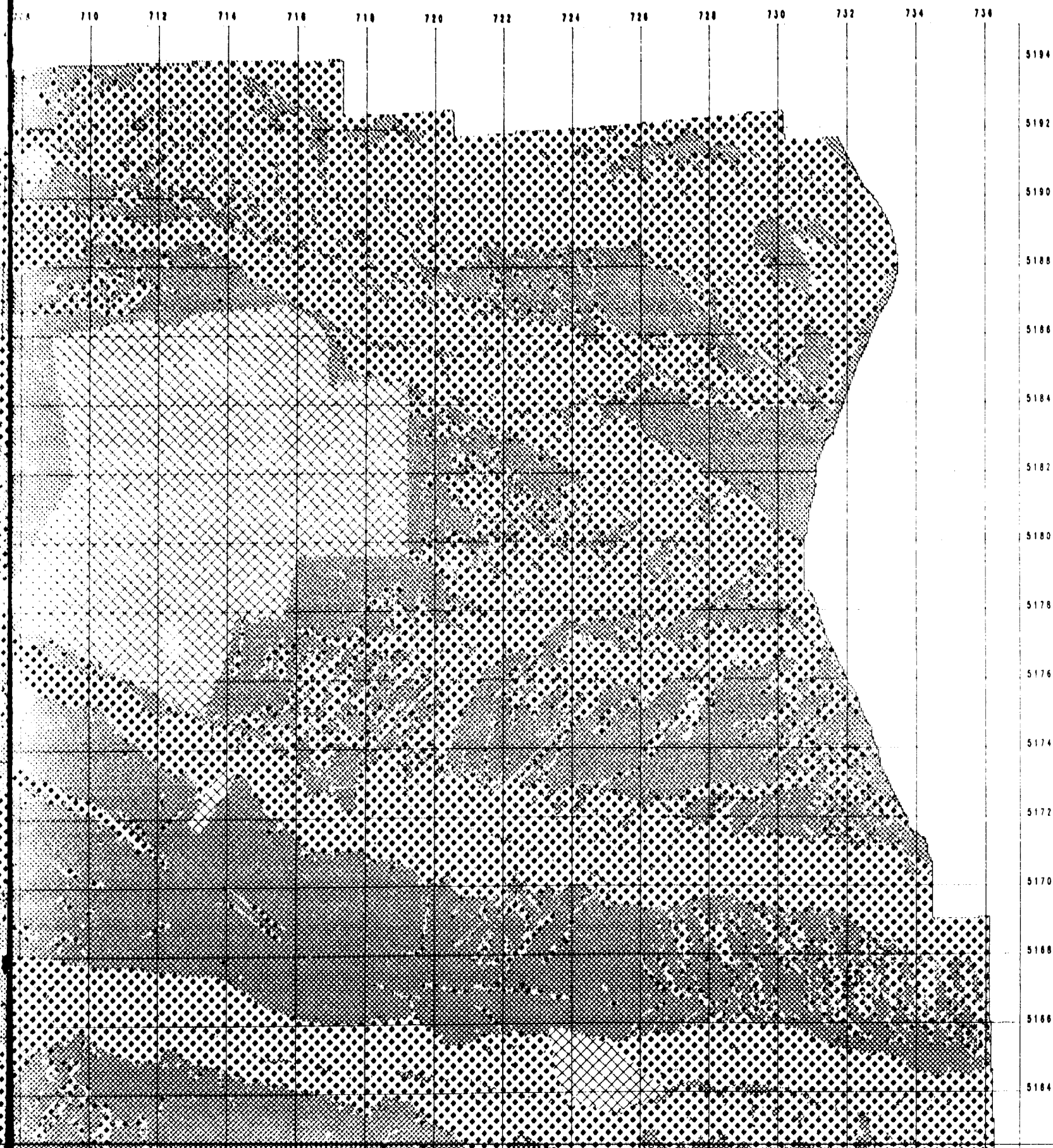
YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

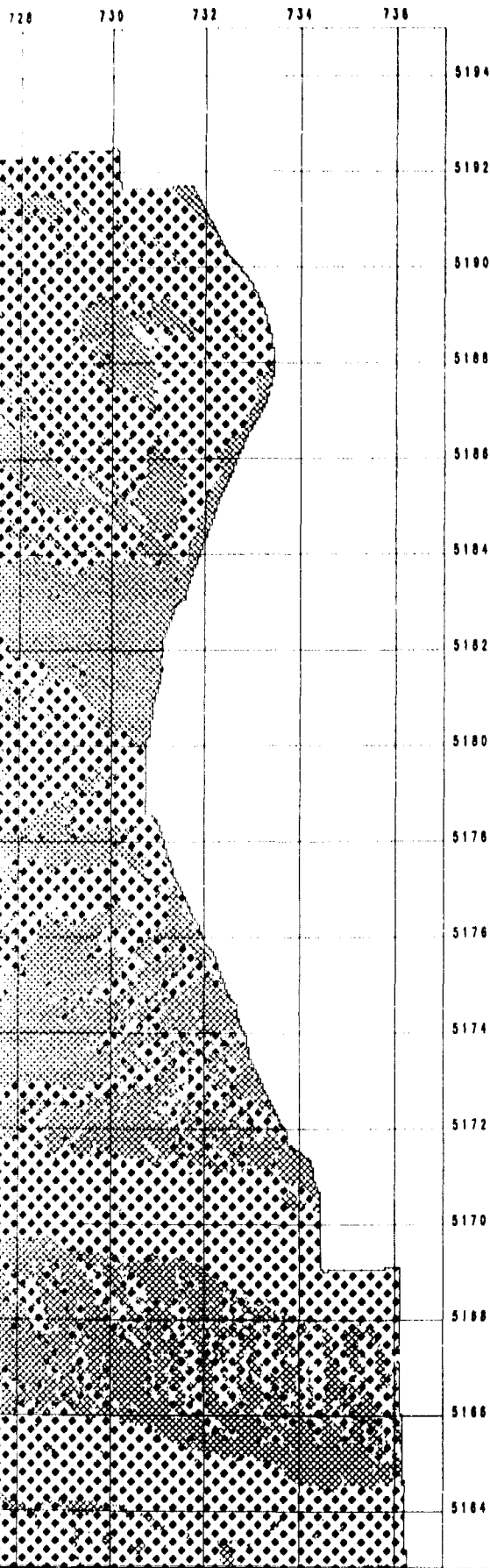
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160
5158



force structure in the dry normal surface condition







U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-5 in)		SEVERE (>12 in)
	SLIGHT (>5-2 in)		URBAN/ OFF LIMITS
	MODERATE (>2-5 in)		WATER

YAKIMA FIRING CENTER

4-3-3 FORCE STRUCTURE

WET-WET SEASON
SLIPPERY CONDITION
10 PASSES

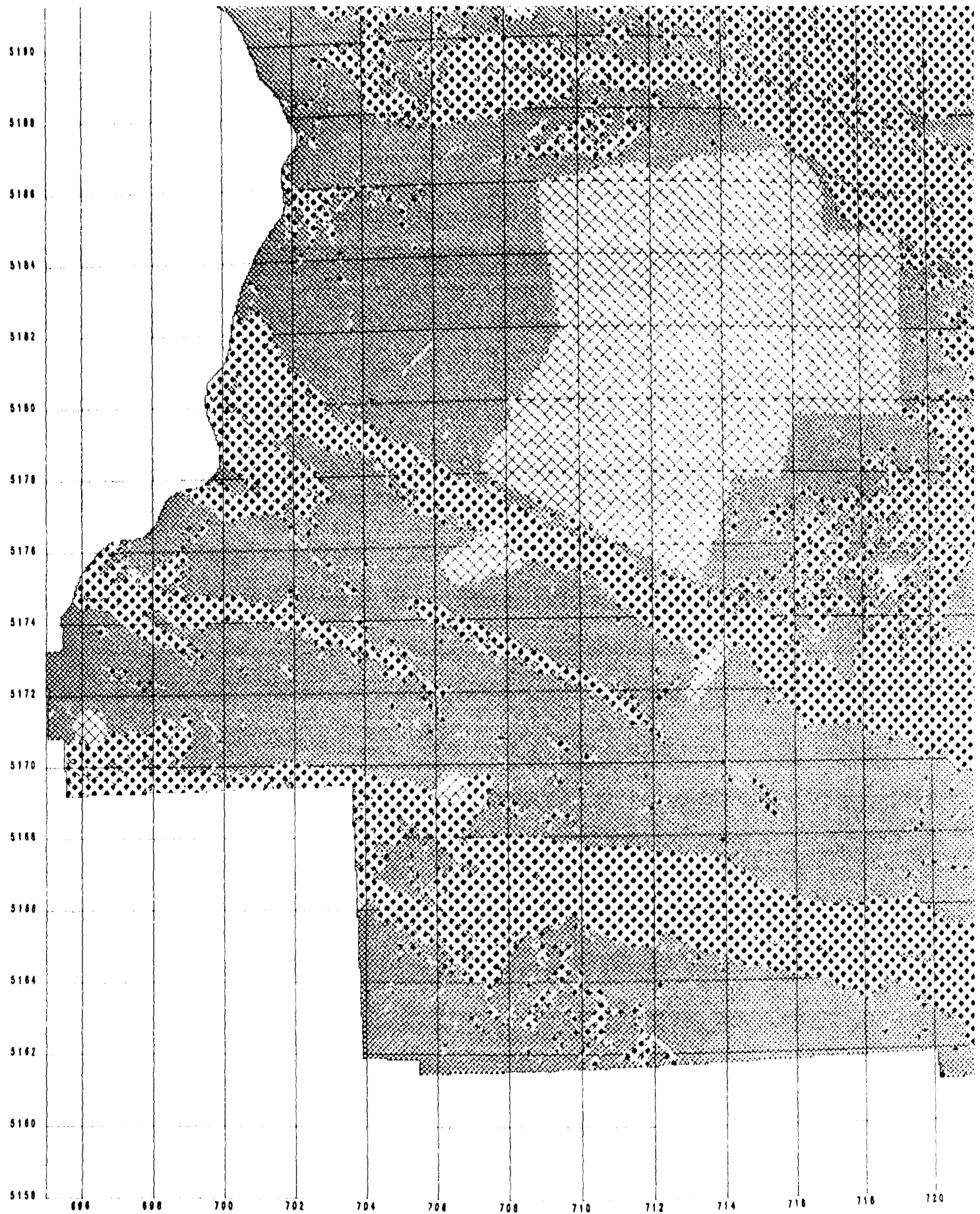


Plate 24. Ten pass soil disturbance level

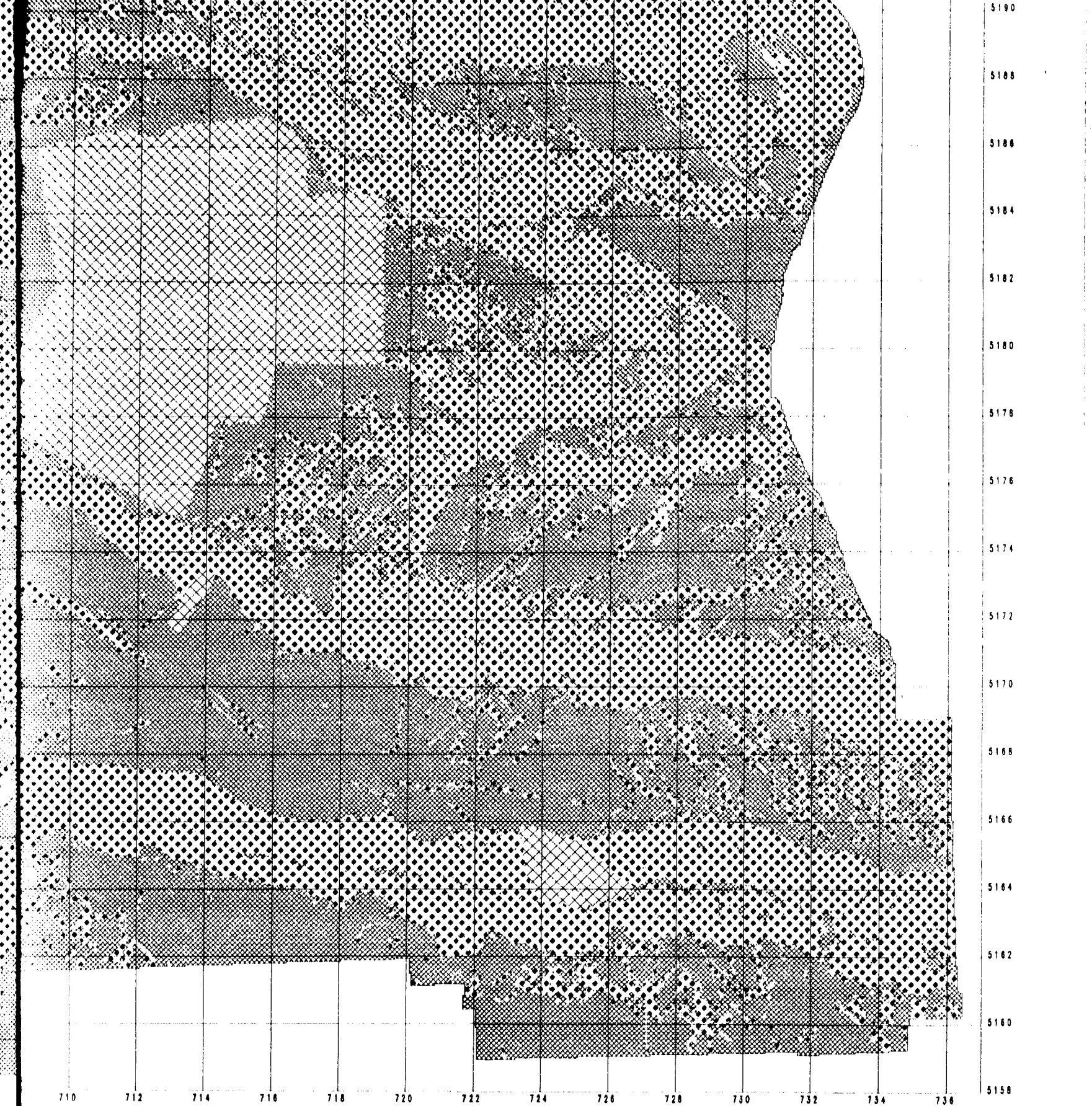
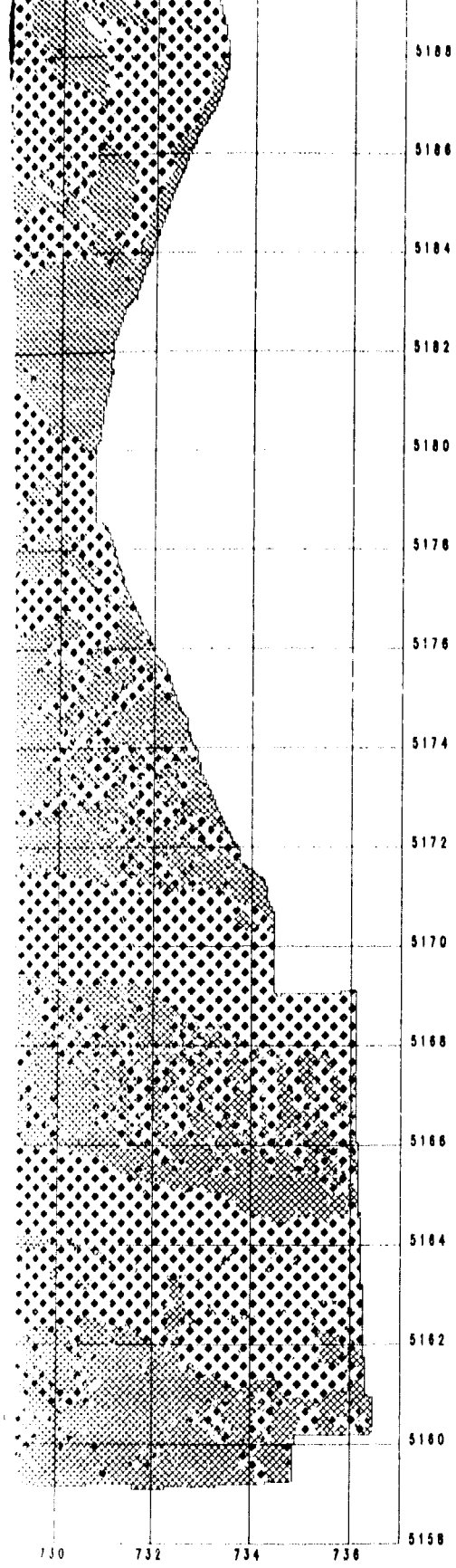


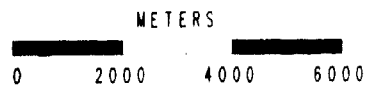
Plate 24. Ten pass soil disturbance level map for the 4-3-3 (8X8) force structure in the wet-wet slippery surface con

SCALE 1:100000

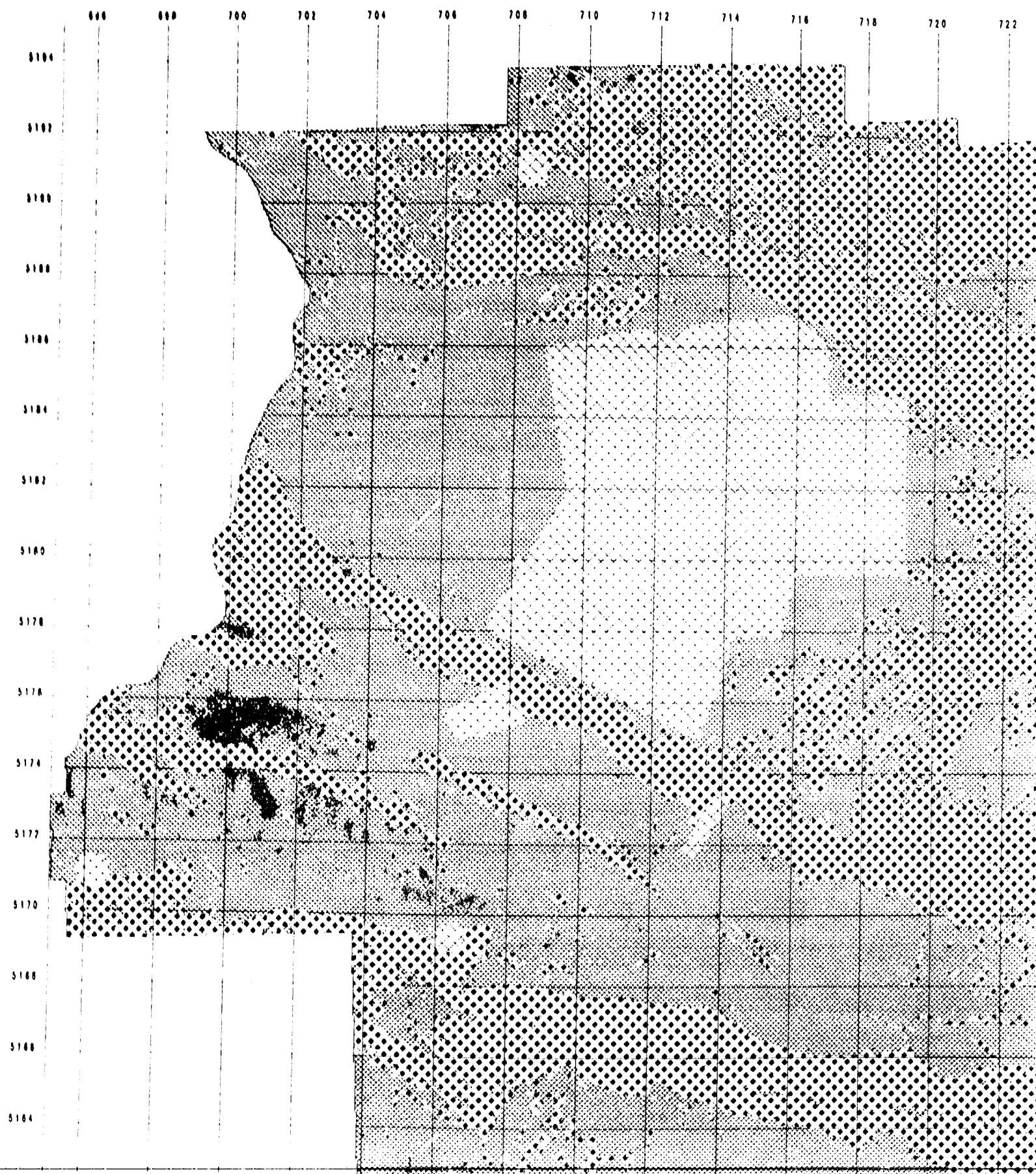


	NOGO		HIGH (>5-12in)
	MINIMUM (0-.5in)		SEVERE (>12in)
	SLIGHT (>.5-2in)		URBAN/ OFF LIMITS
	MODERATE (>2-5in)		WATER

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES



Structure in the wet-wet slippery surface condition



12 714 716 718 720 722 724 726 728 730 732 734 736



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

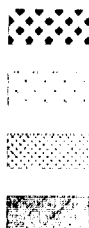
5172

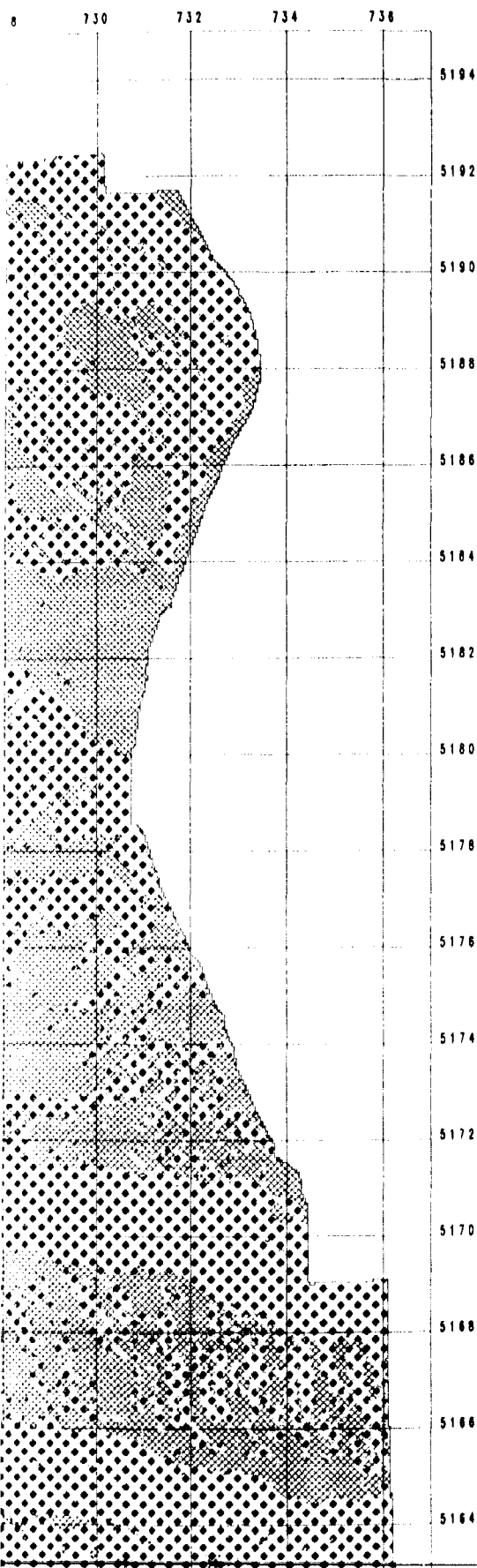
5170

5168

5166

5164





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER

4-3-3 FORCE STRUCTURE

WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

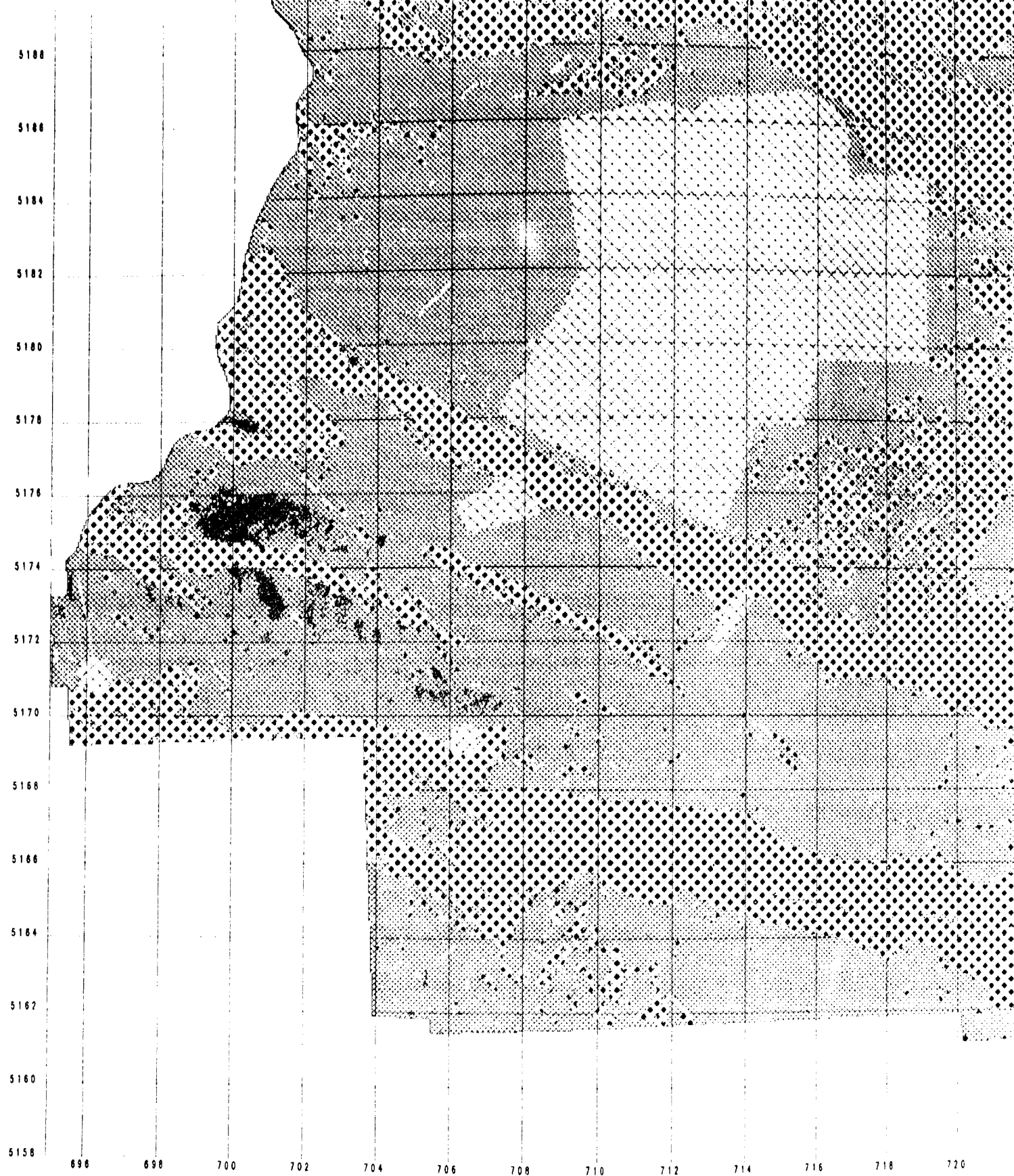


Plate 25. Fifty pass soil disturbance level

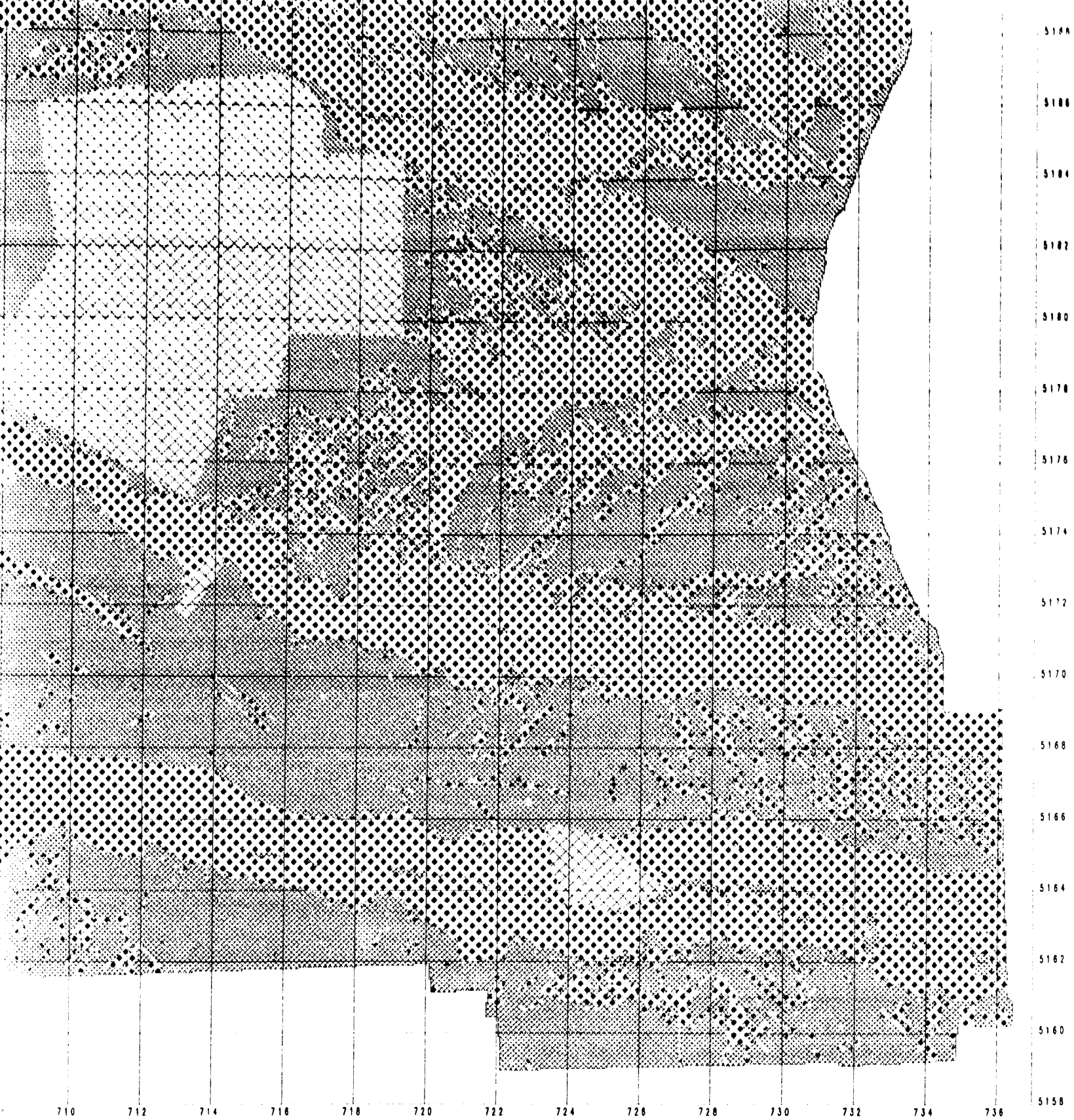
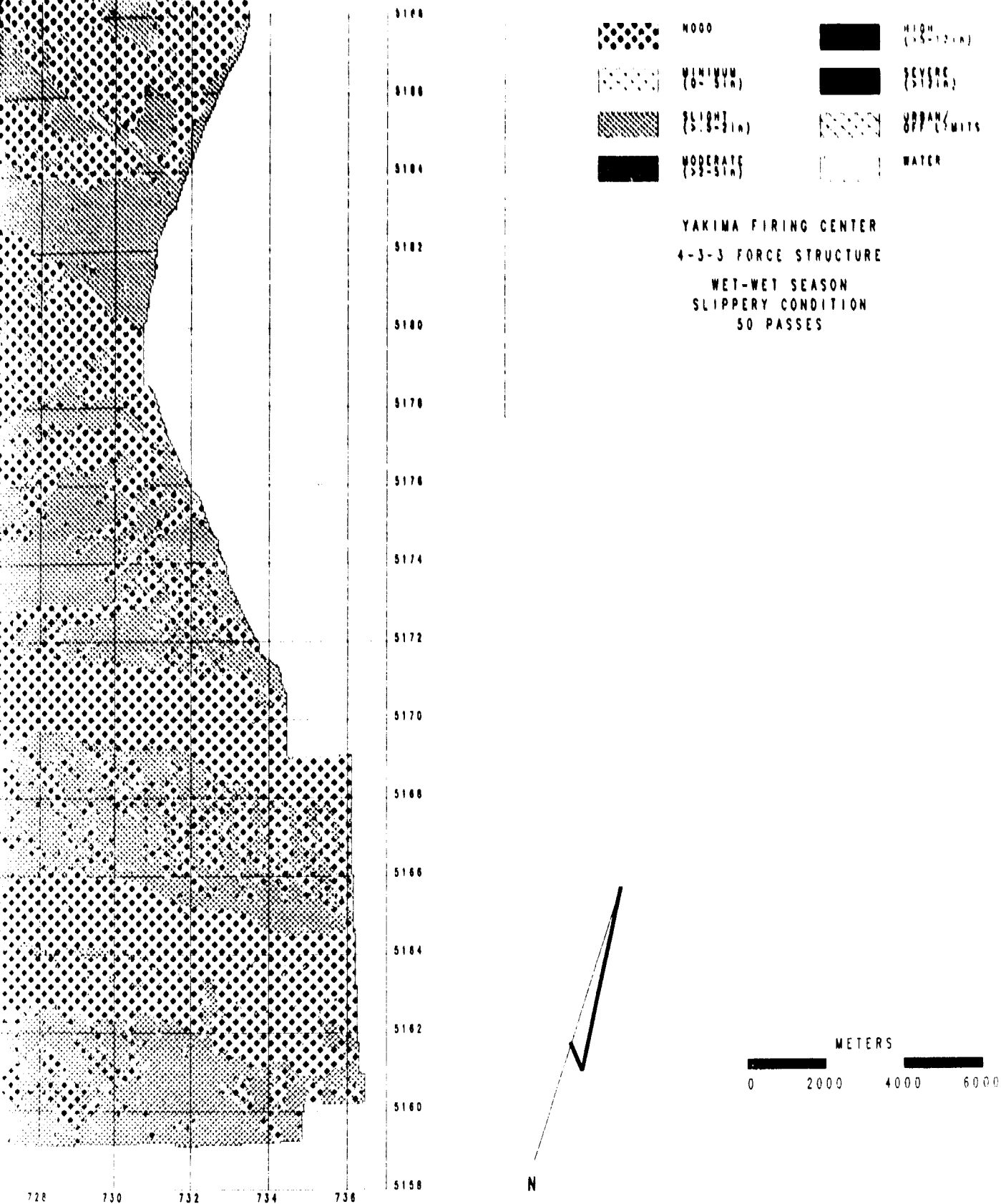
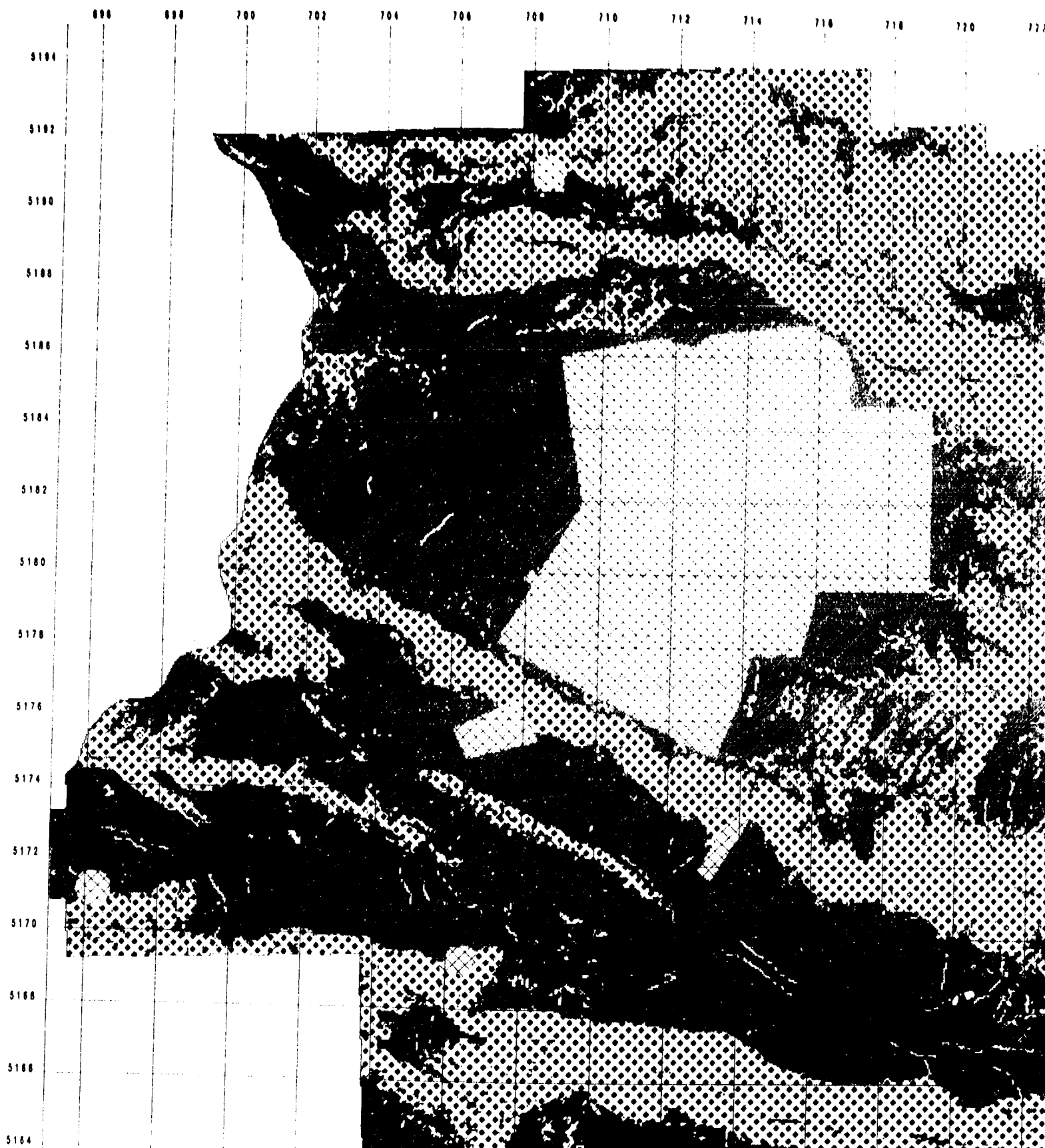


Plate 25. Fifty pass soil disturbance level map for the 4-3-3 (8X8) force structure in the wet-wet slippery surface con



3) force structure in the wet-wet slippery surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

728 730 732 734 736

5104

5102

5100

5108

5106

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER

4-3-3 FORCE STRUCTURE

WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

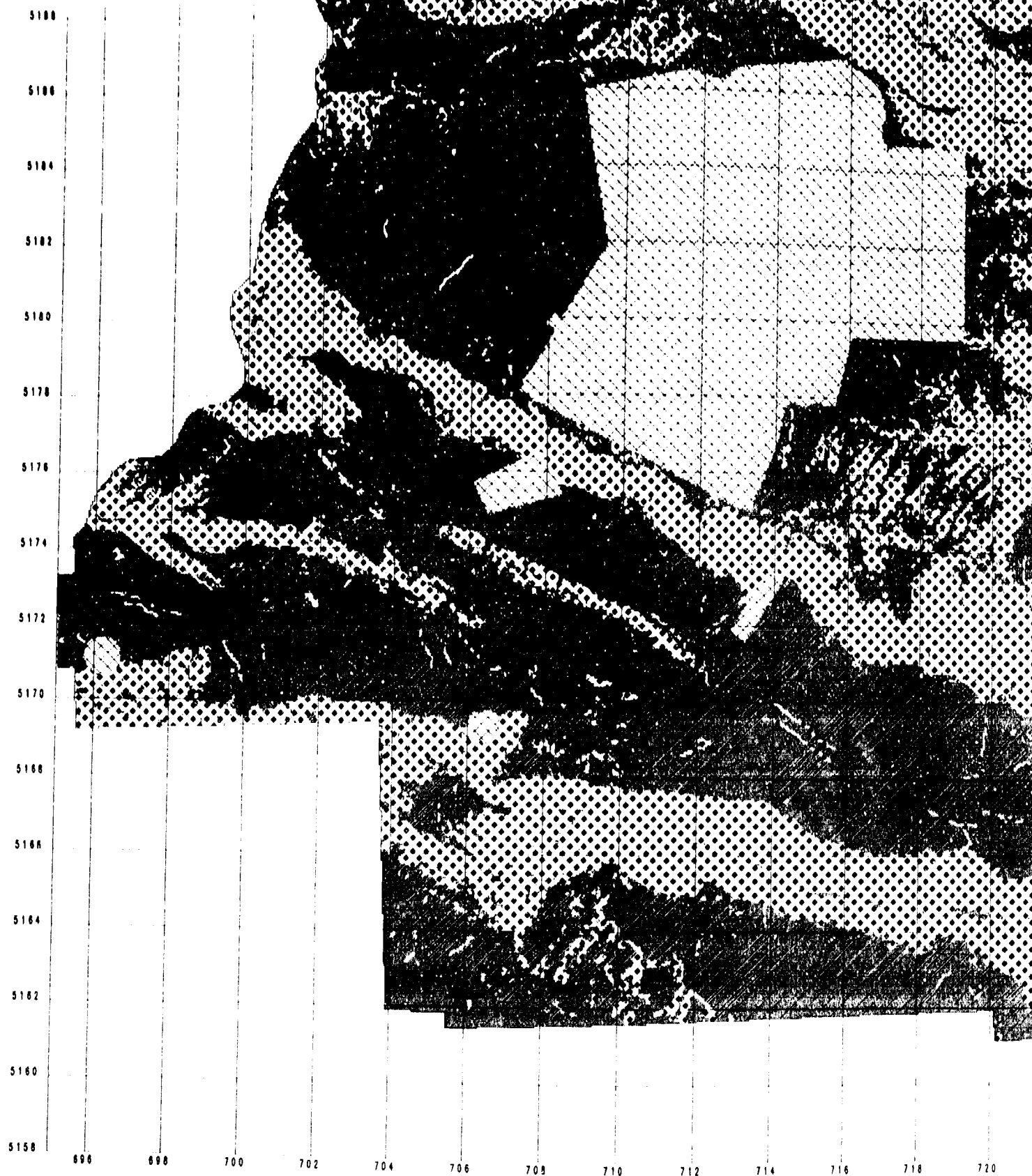


Plate 26. One thousand pass soil disturbance level

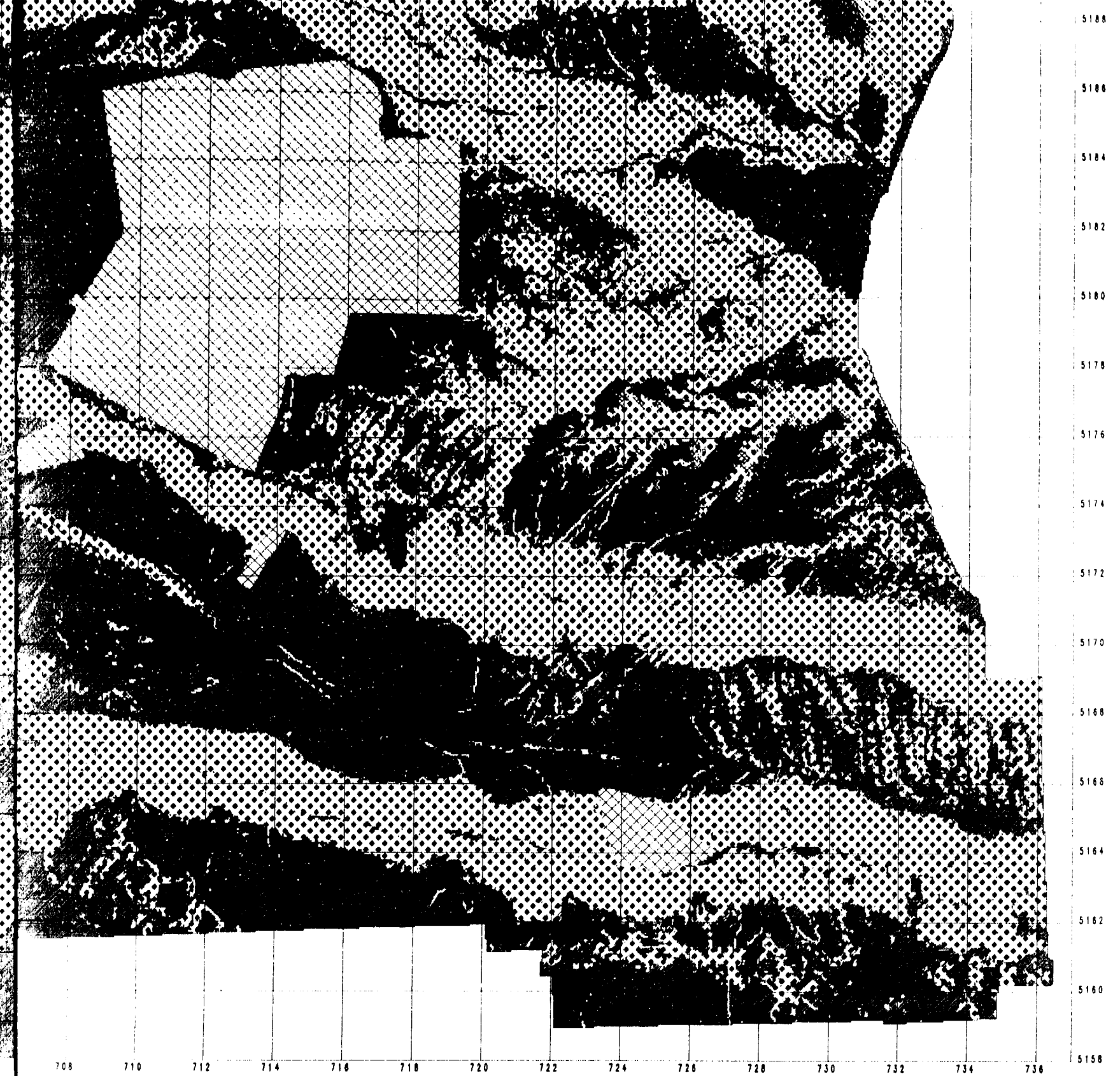
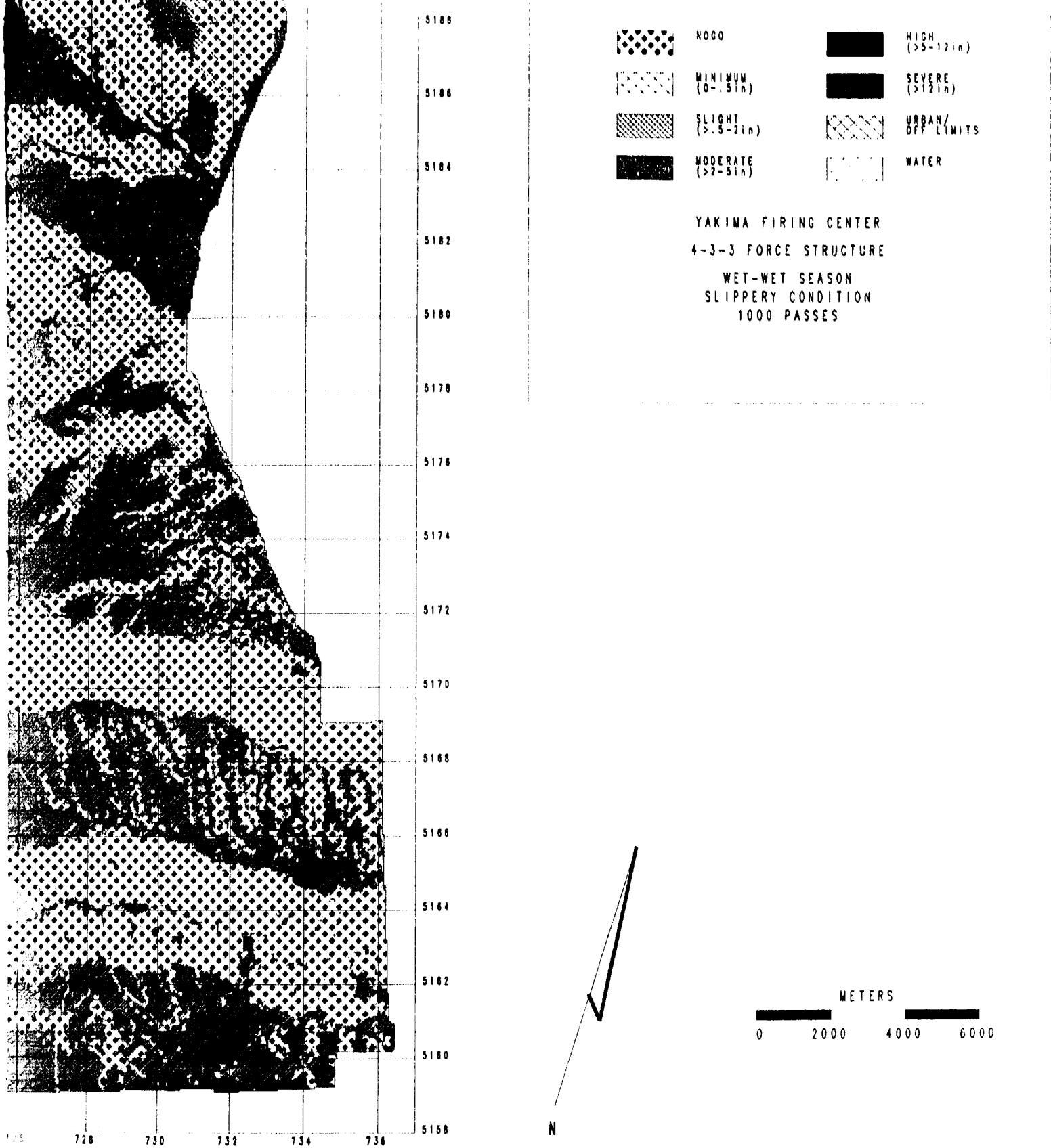
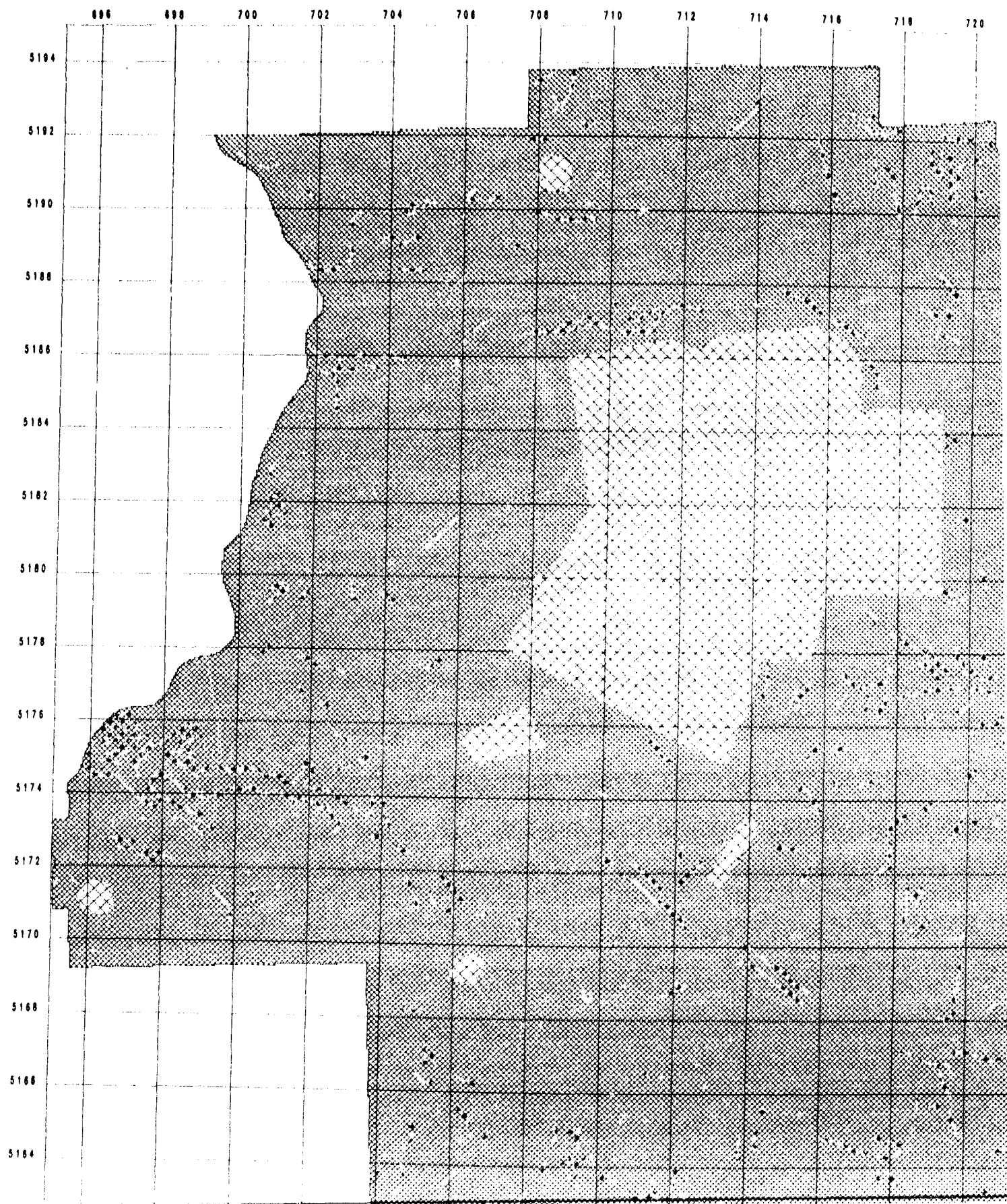


Plate 26. One thousand pass soil disturbance level map for the 4-3-3 (8X8) force structure in the wet-wet slippery surface



ce (8X8) force structure in the wet-wet slippery surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

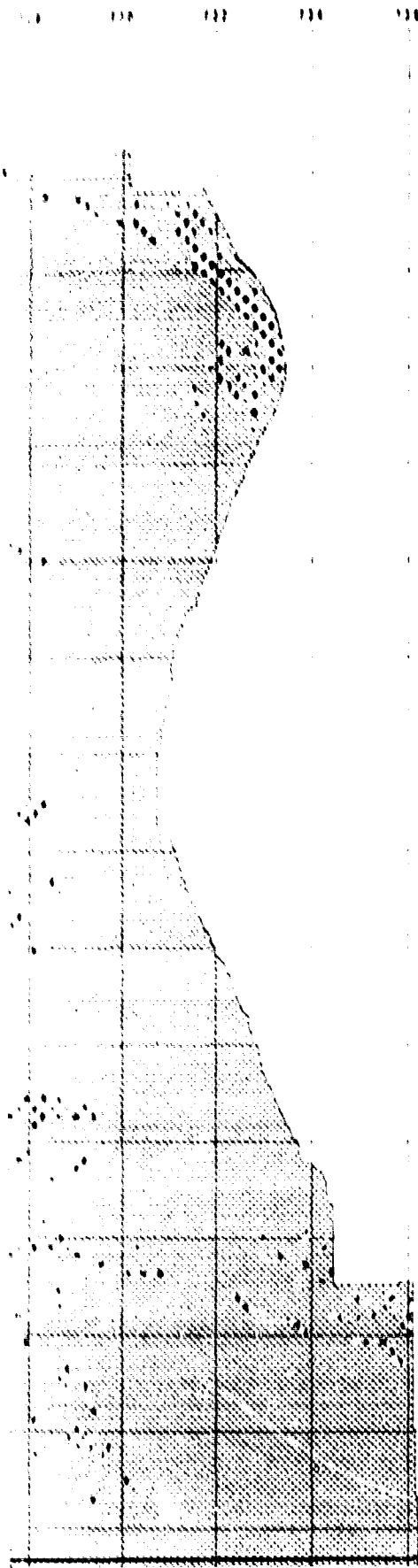
5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



MUD



HIGH
(>5-12 in)



MINIMUM
(0-5 in)



SEVERE
(>12 in)



SLIGHT
(>5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

YAKIMA FIRING CENTER

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160
5158

696 698 700 702 704 706 708 710 712 714 716 718 720 722

Plate 27. Ten pass soil disturbance level map

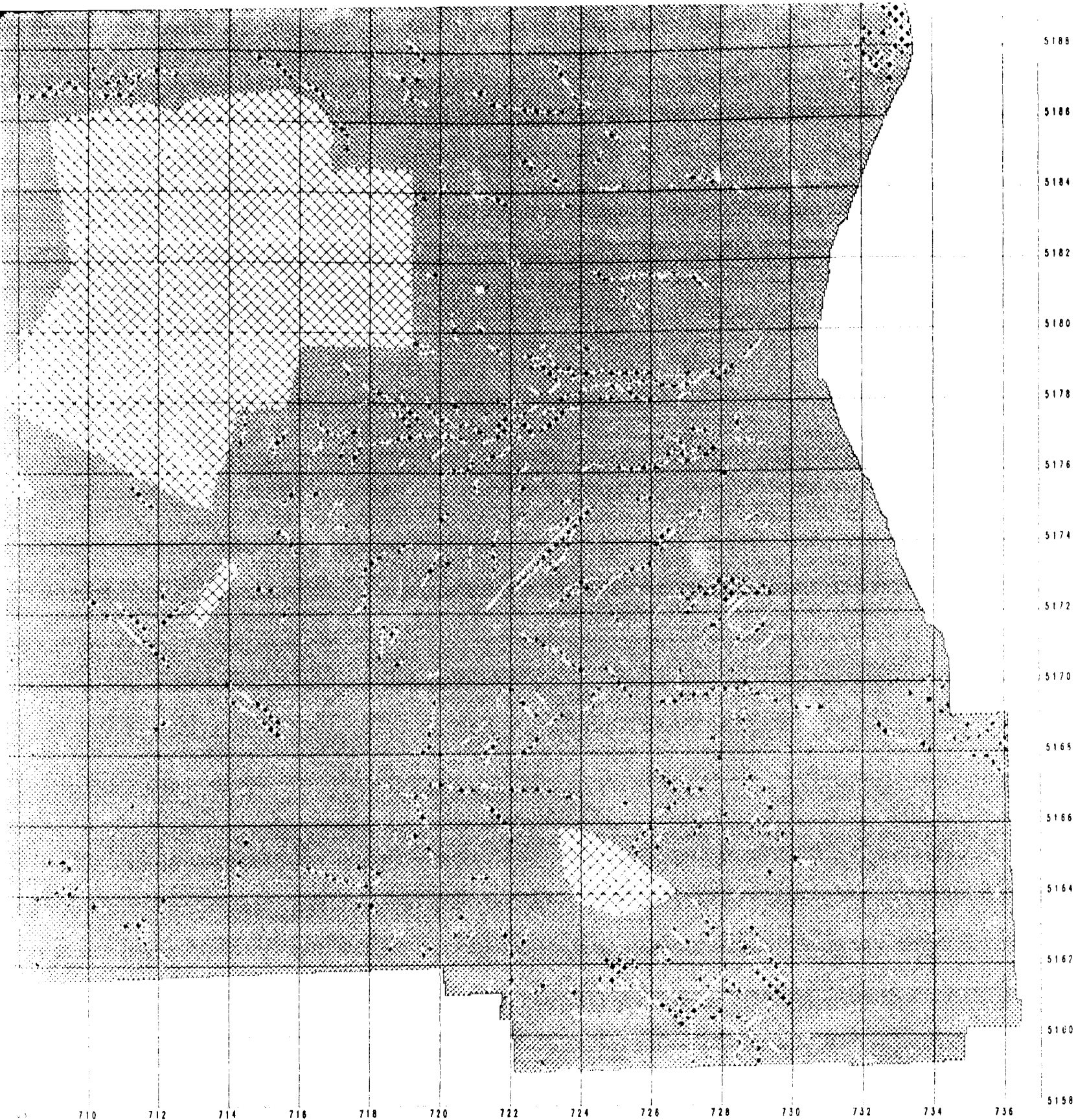
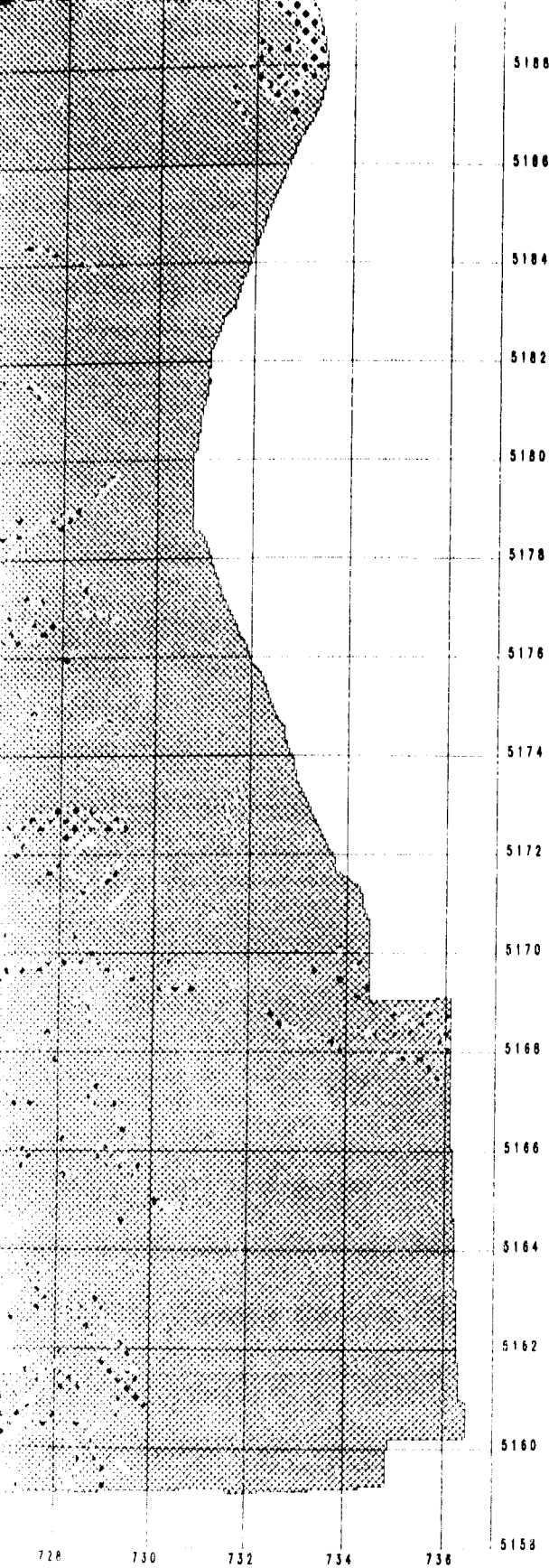


Plate 27. Ten pass soil disturbance level map for the 5-5-0 force structure in the dry normal surface condition

SCALE 1:100000



NOGO



MINIMUM
(0-.5in)



SLIGHT
(.5-2in)



MODERATE
(2-5in)



HIGH
(5-12in)



SEVERE
(12in)

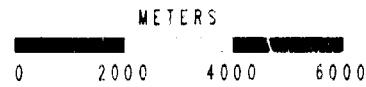


URBAN/
OFF LIMITS

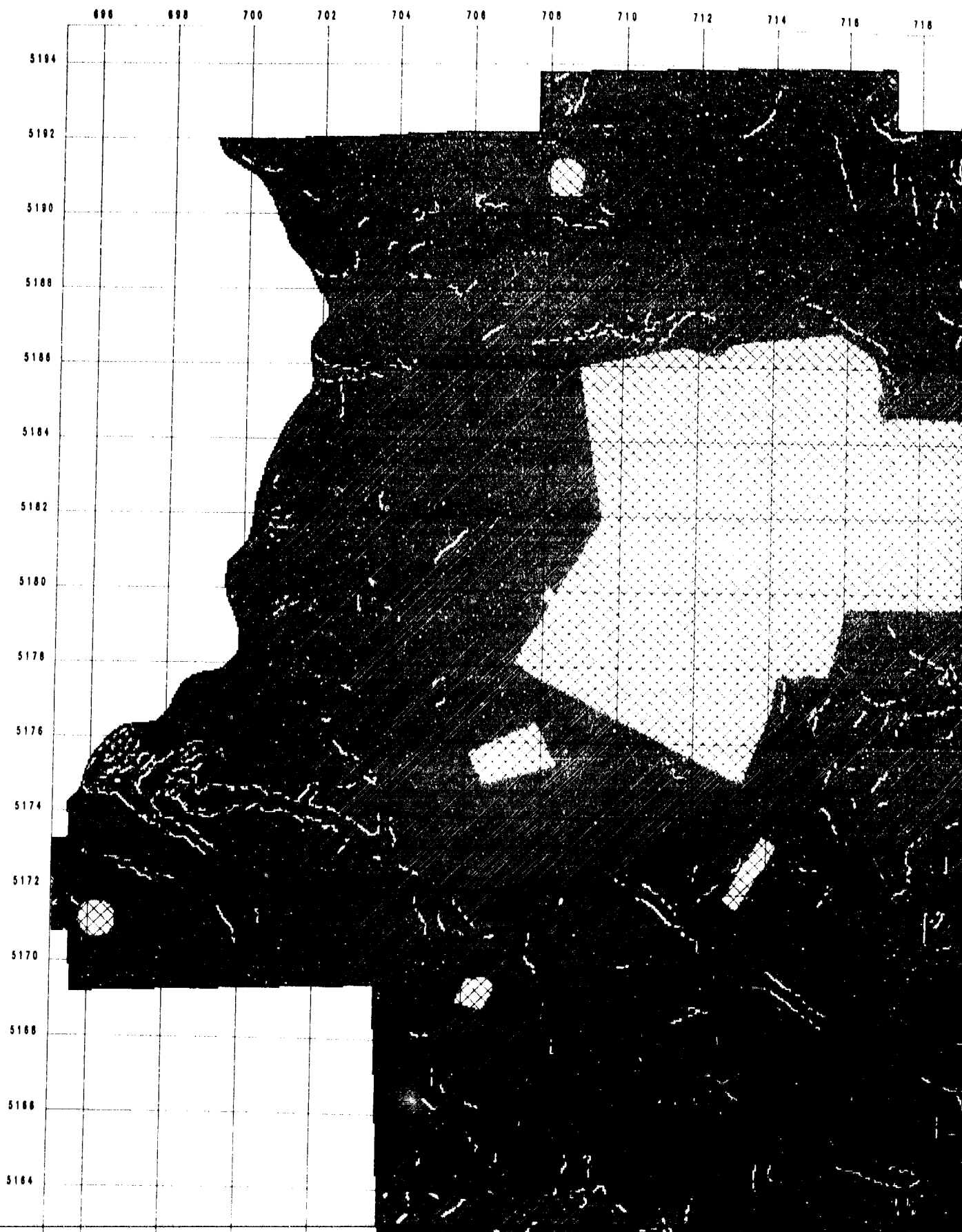


WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES



Force structure in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

728 730 732 734 738

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

YAKIMA FIRING CENTER

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

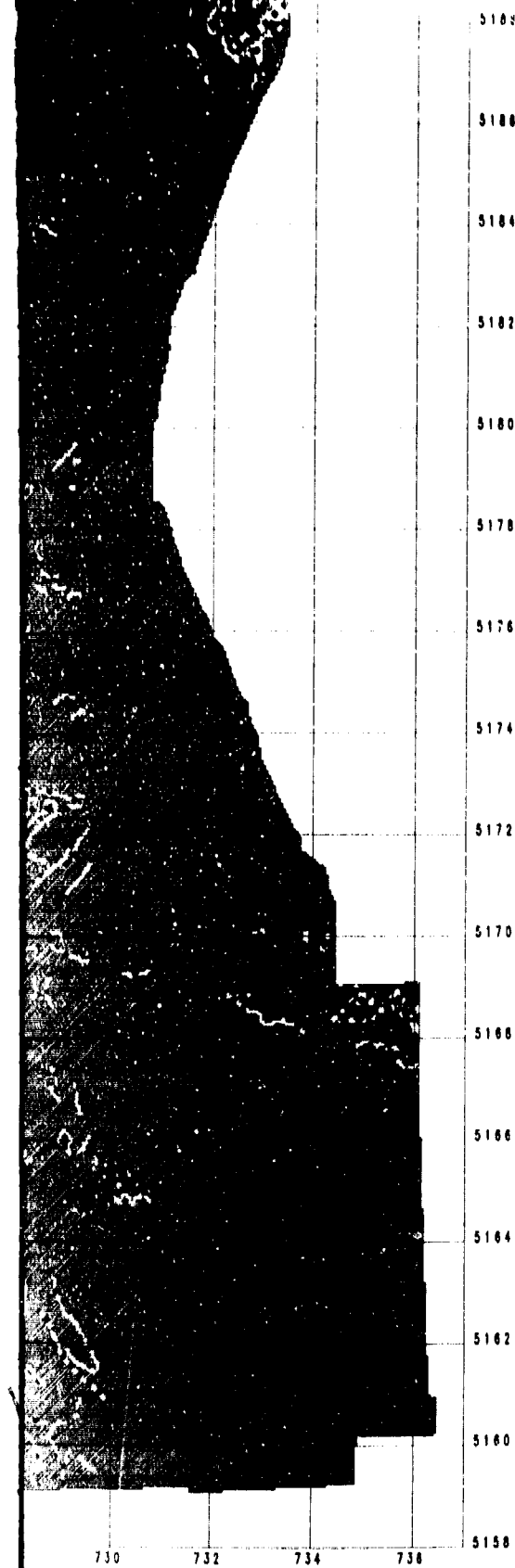
50 PASSES



Plate 28. Fifty pass soil disturbance



Plate 28. Fifty pass soil disturbance level map for the 5-5-0 force structure in the dry normal surface condition



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-5 in)



SEVERE
(>12 in)



SLIGHT
(>5-2 in)



URBAN/
OFF LIMITS

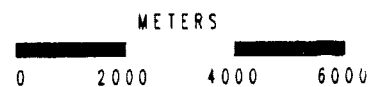


MODERATE
(>2-5 in)

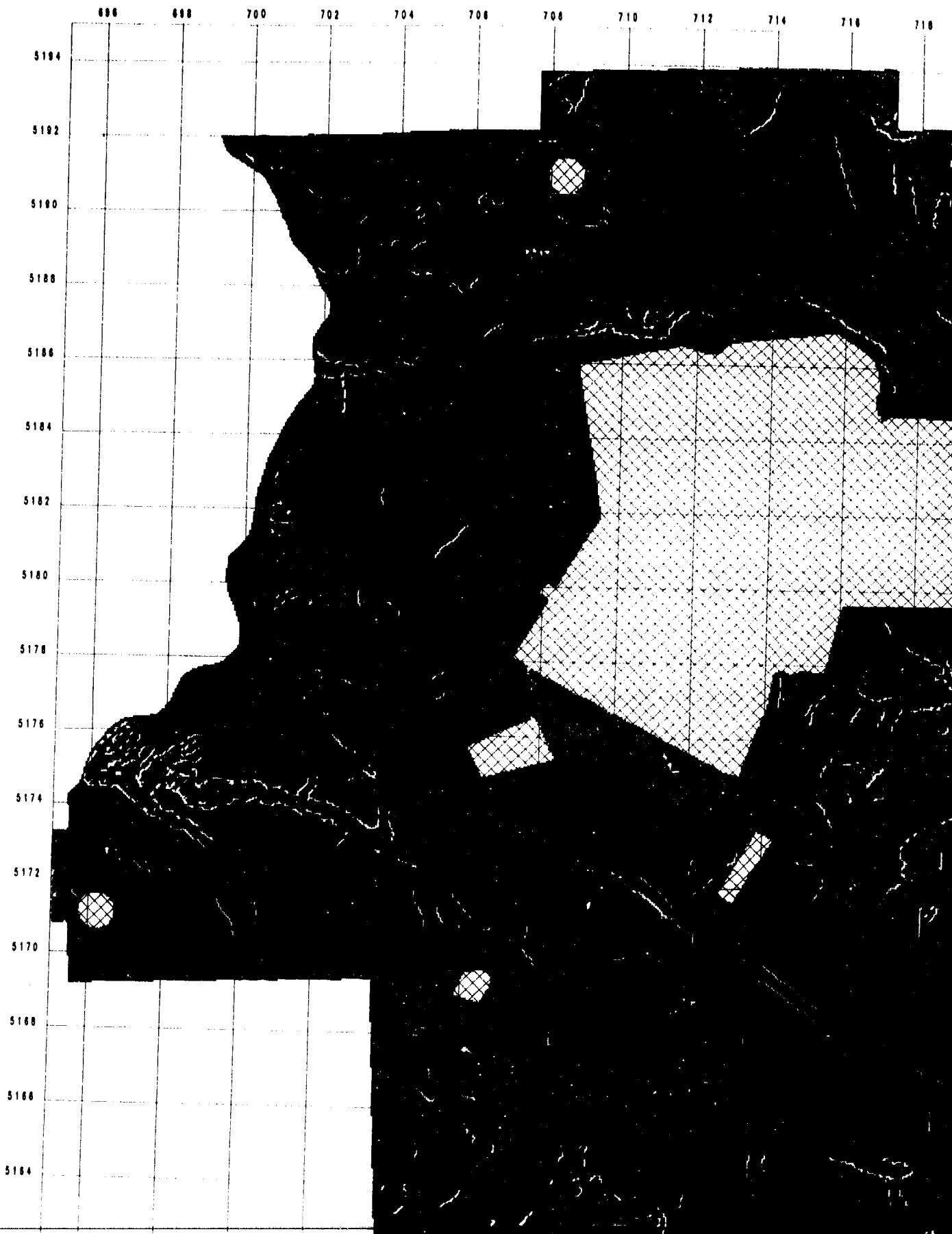


WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES



Structure in the dry normal surface condition



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

728 730 732 734 736

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162

5160

5158

5156

5154



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12in)



MINIMUM
(0-.5in)



SEVERE
(>12in)



SLIGHT
(.5-2in)



URBAN/
OFF LIMITS



MODERATE
(2-5in)



WATER

YAKIMA FIRING CENTER

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

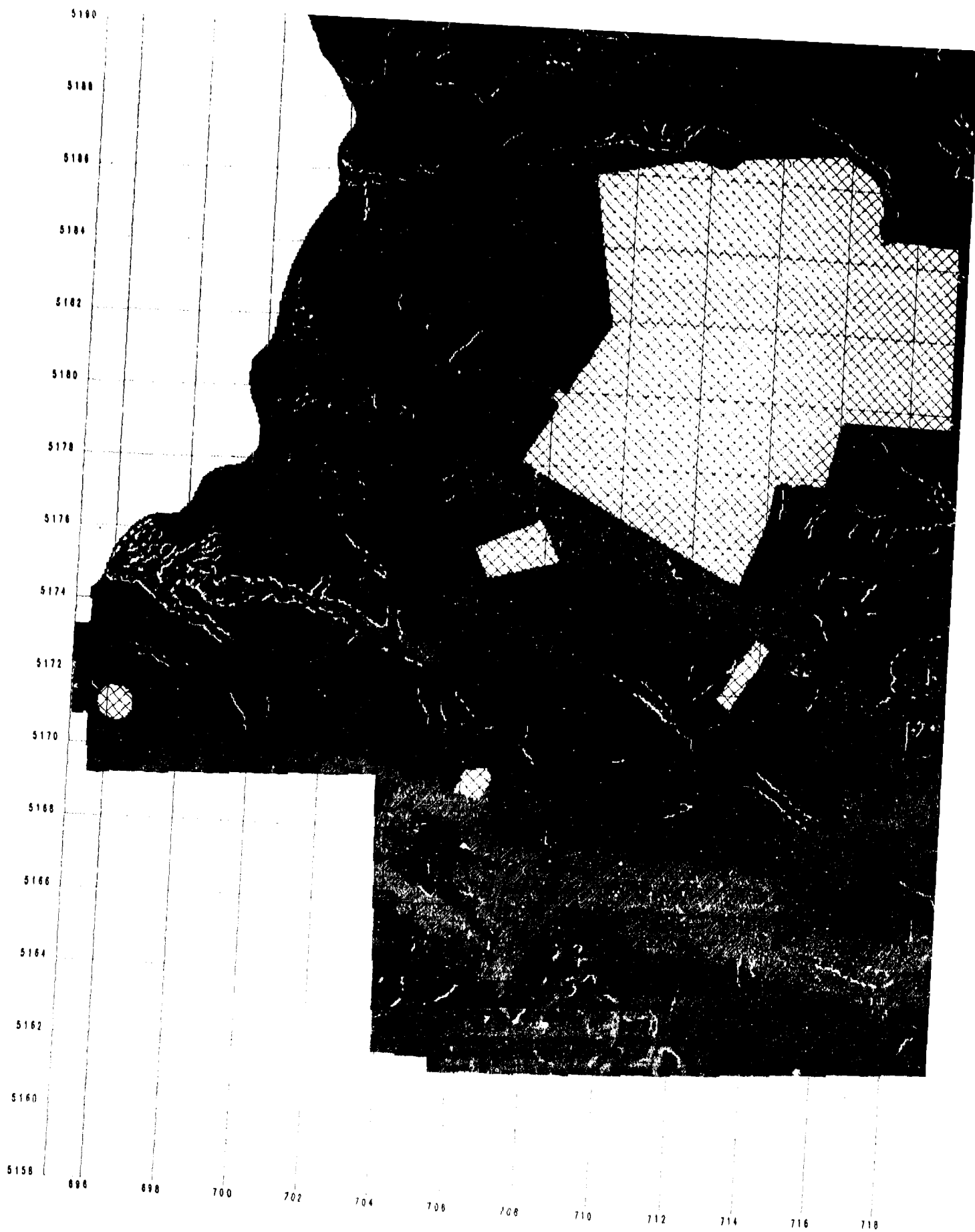










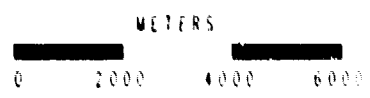
Plate 29. One thousand pass soil distu

SCALE 1:100000

5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160
5158

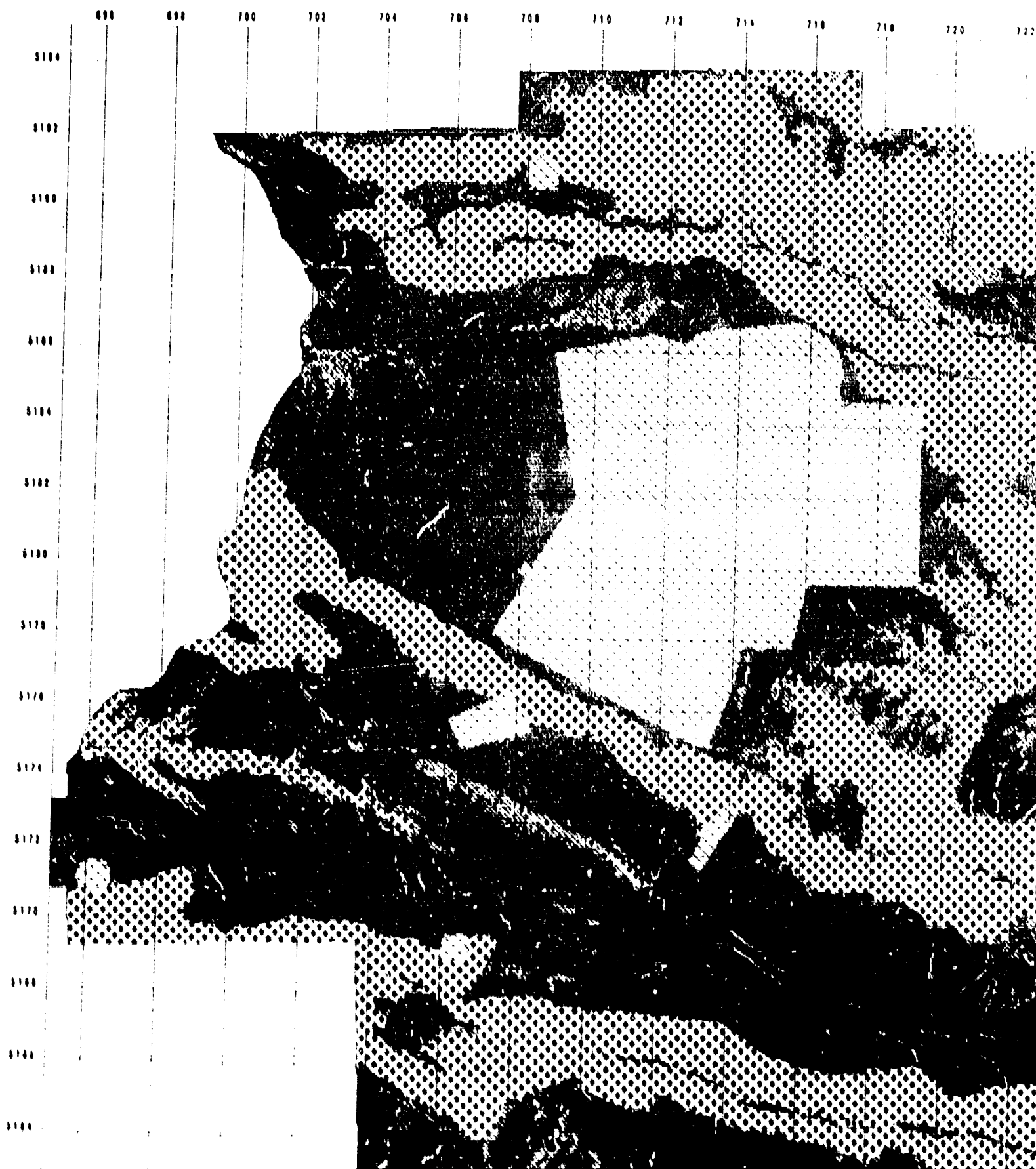
	NOGO		HIGH (58-121m)
	MINIMUM (0-51m)		SEVERE (51-121m)
	SLIGHT (51-81m)		URBAN/ OFF (MITS)
	MODERATE (81-121m)		WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES



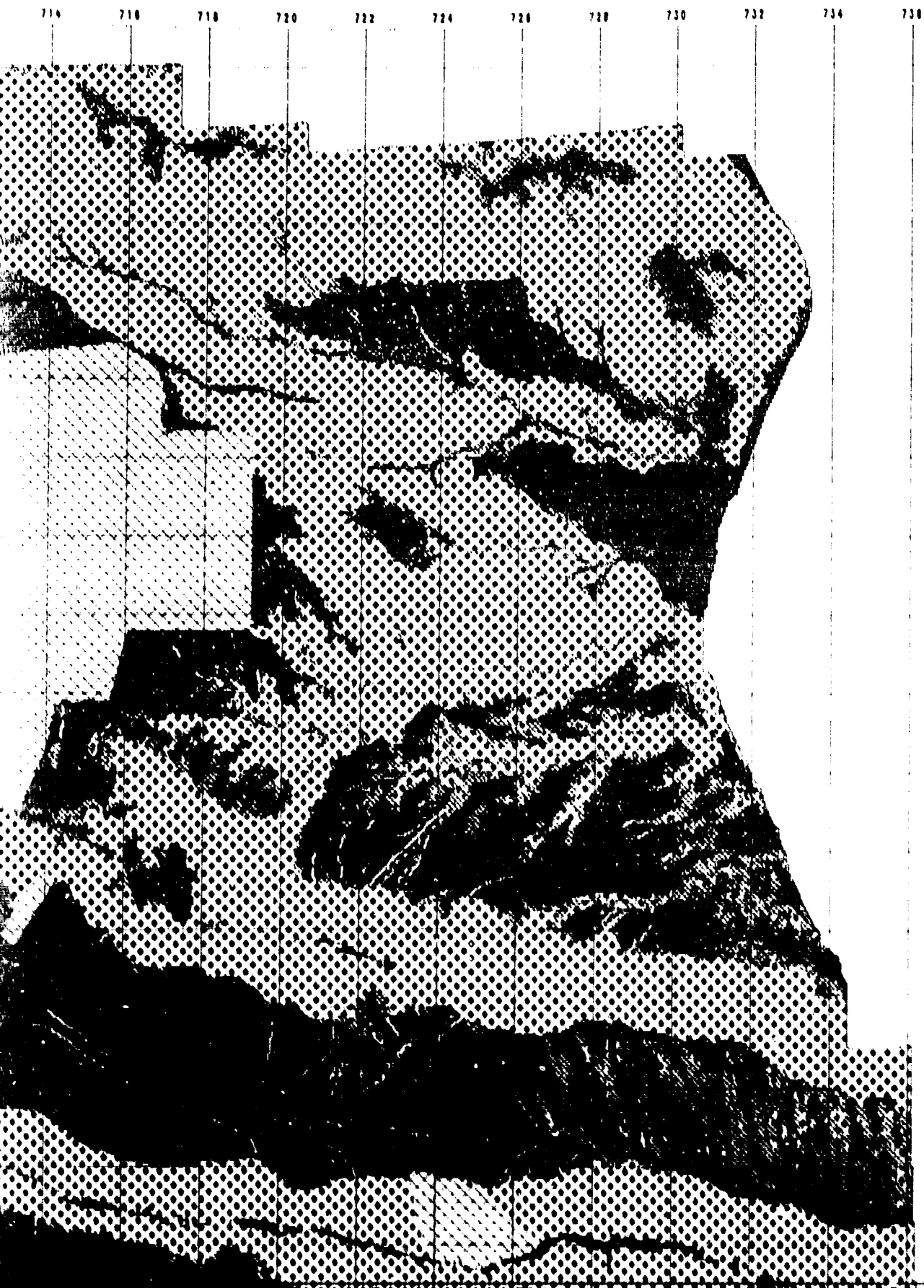
N

in the dry normal surface condition



698 698 700 702 704 706 708 710 712 714 716 718 720 722

5104
5102
5100
5100
5100
5104
5102
5100
5170
5170
5174
5172
5170
5100
5100
5100



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



5010



NO



MIN
(0-10)



SL
(1-5)



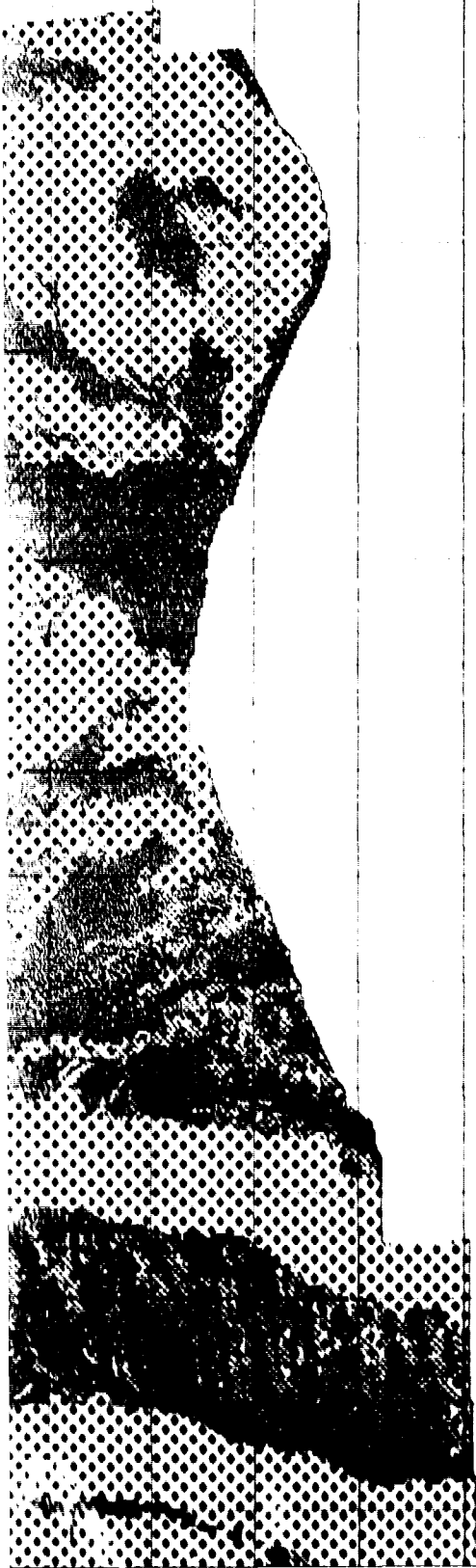
MOD
(1-2)

YAK

S

S









728 730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000

	NOGO		HIGH (>5-12 in)
	MINIMUM (0-.5 in)		SEVERE (>12 in)
	SLIGHT (.5-2 in)		URBAN/ OFF LIMITS
	MODERATE (2-5 in)		WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162

5160

5158

698

699

700

701

702

703

704

705

706

707

708

709

710

711

Plate 30. Ten pass soil disturbance level map

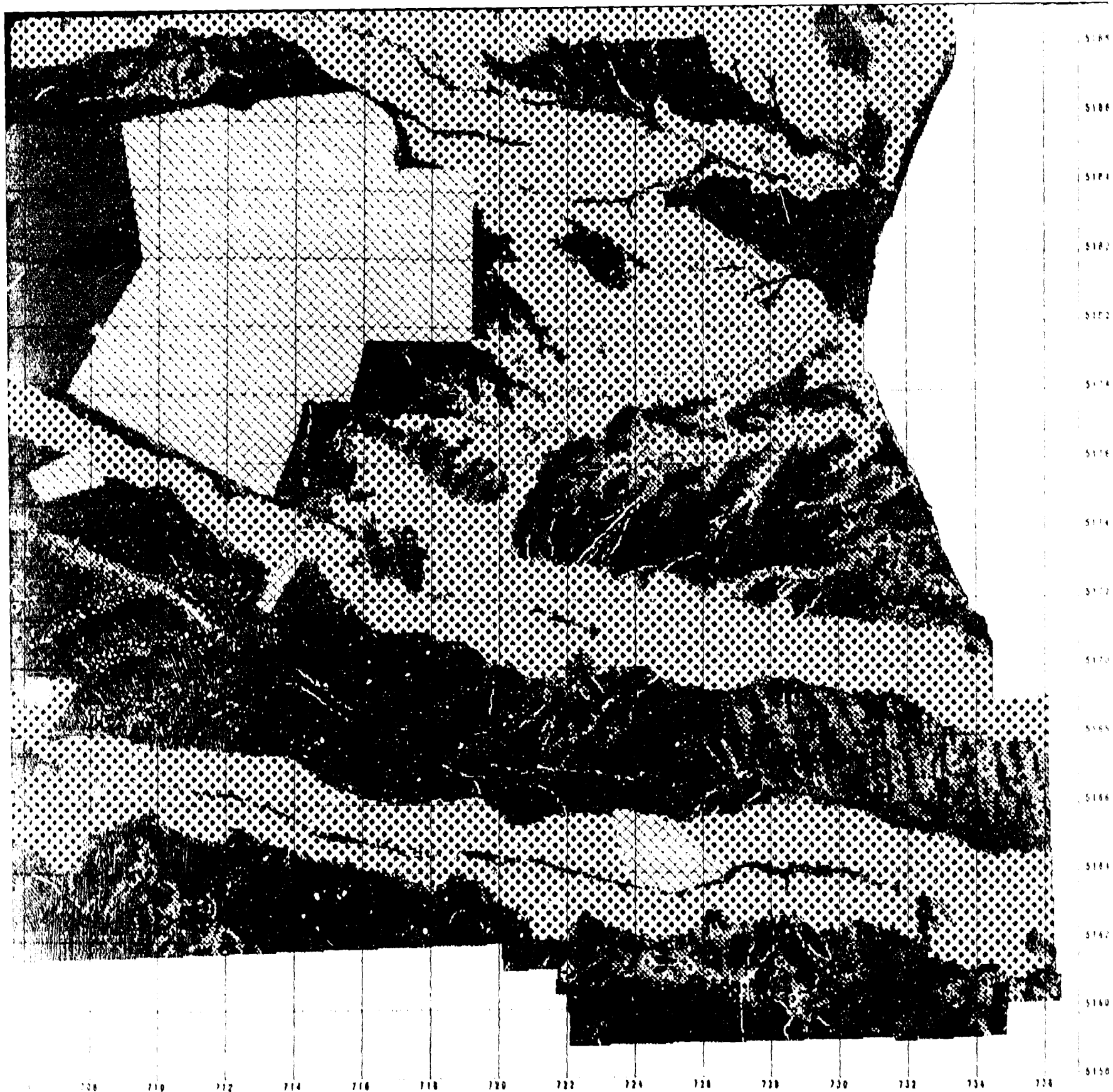


Plate 30. Ten pass soil disturbance level map for the 5-5-0 force structure in the wet-wet slippery surface



5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162
5160
5158

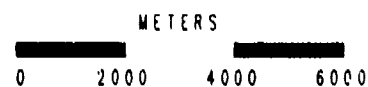


NOGO
MINIMUM
(0-5in)
SLIGHT
(>5-21in)
MODERATE
(>2-51in)



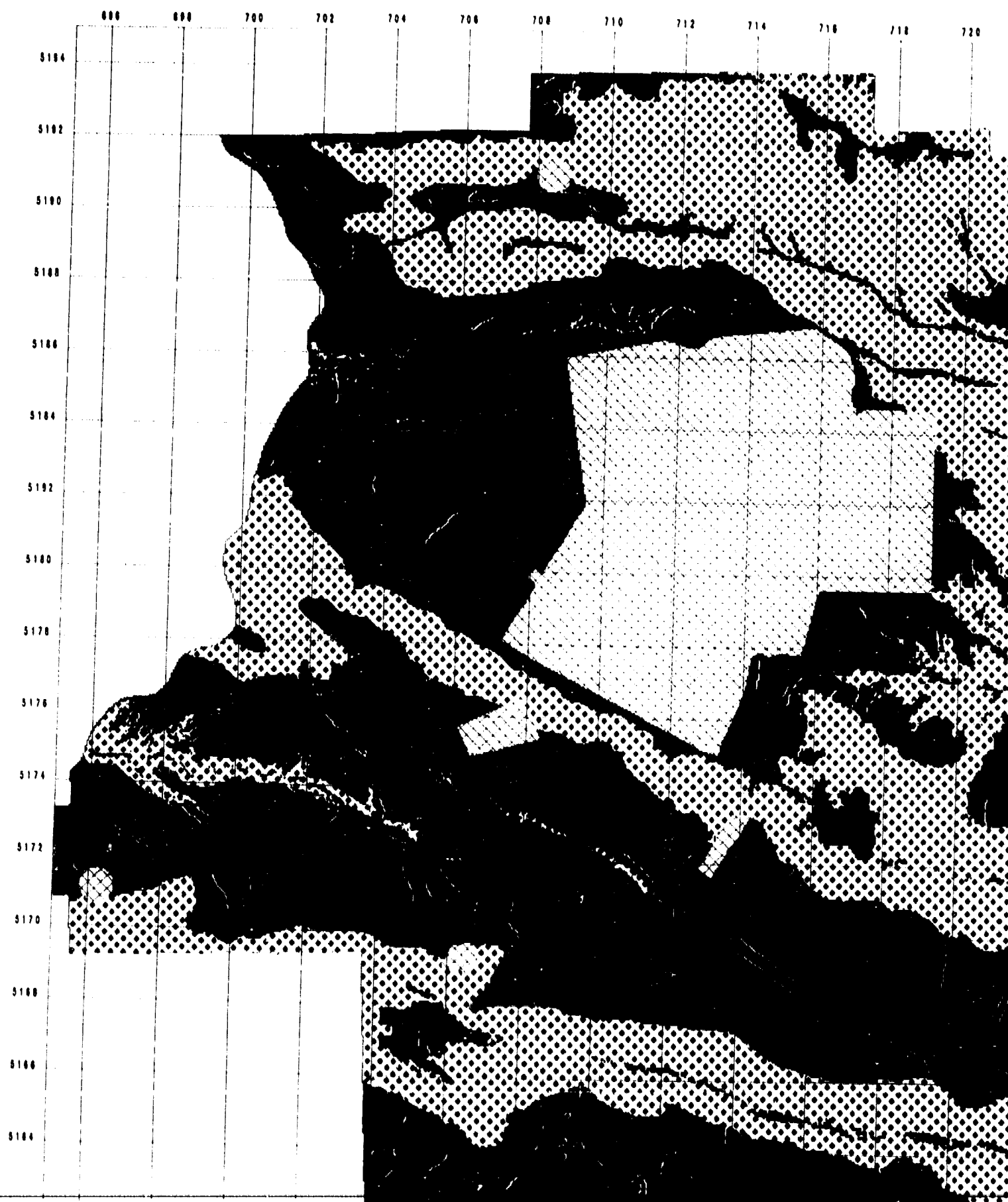
HIGH
(>5-12in)
SEVERE
(>12in)
URBAN/
OFF LIMITS
WATER

YAKIMA FIRING CENTER
5-5 0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES

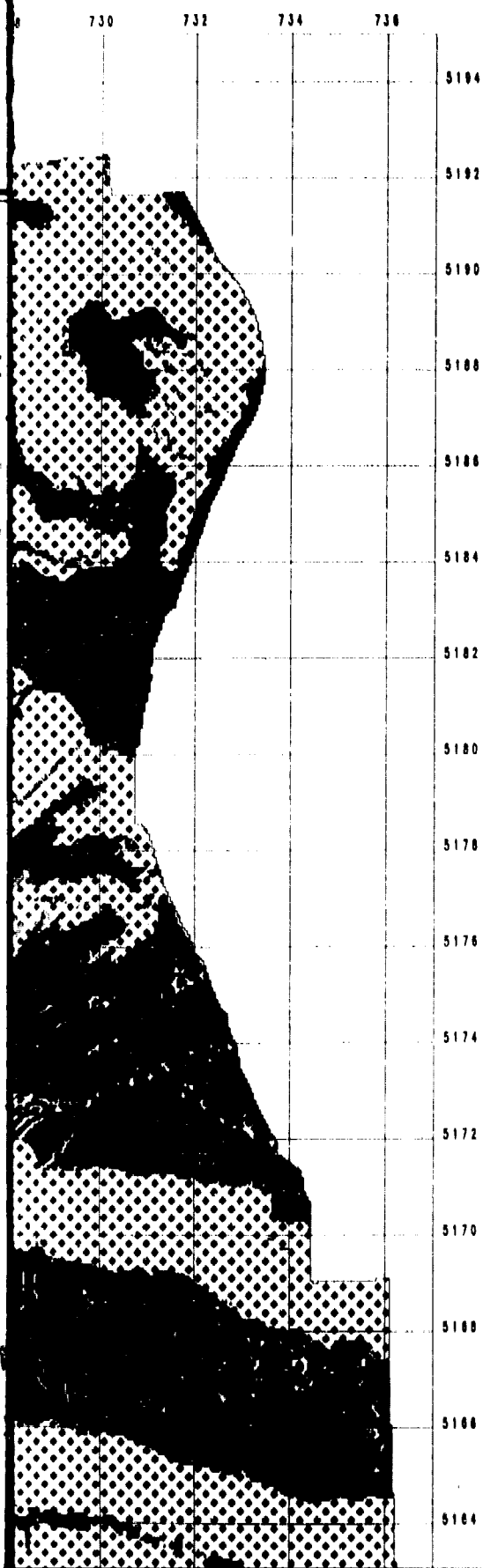


728 730 732 734 736

structure in the wet-wet slippery surface condition















U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS
SCALE 1:160000

	NOGO		HIGH (>5-12in)
	MINIMUM (0-.5in)		SEVERE (>12in)
	SLIGHT (>.5-2in)		URBAN/ OFF LIMITS
	MODERATE (>2-5in)		WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

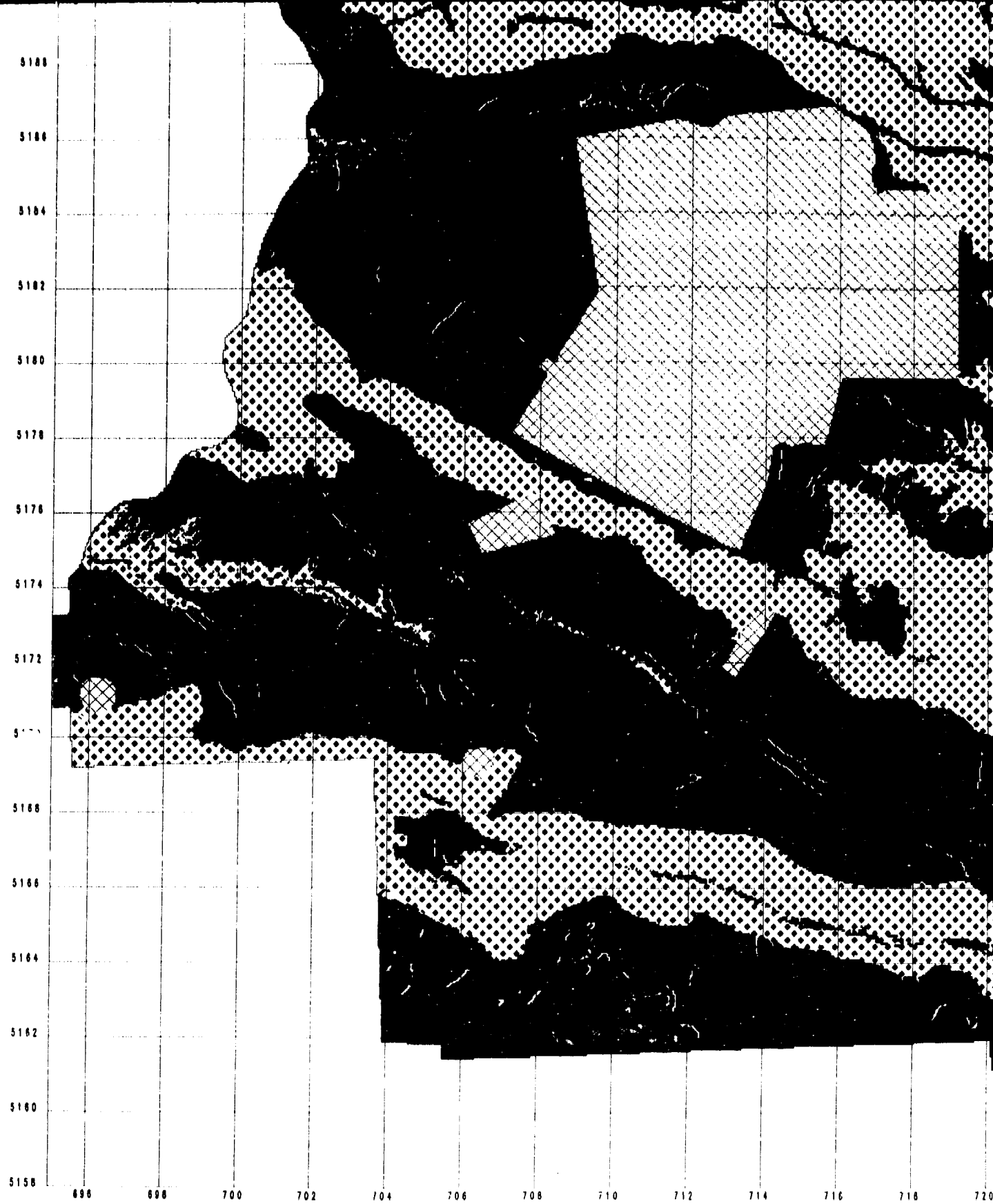


Plate 31. Fifty pass soil disturban

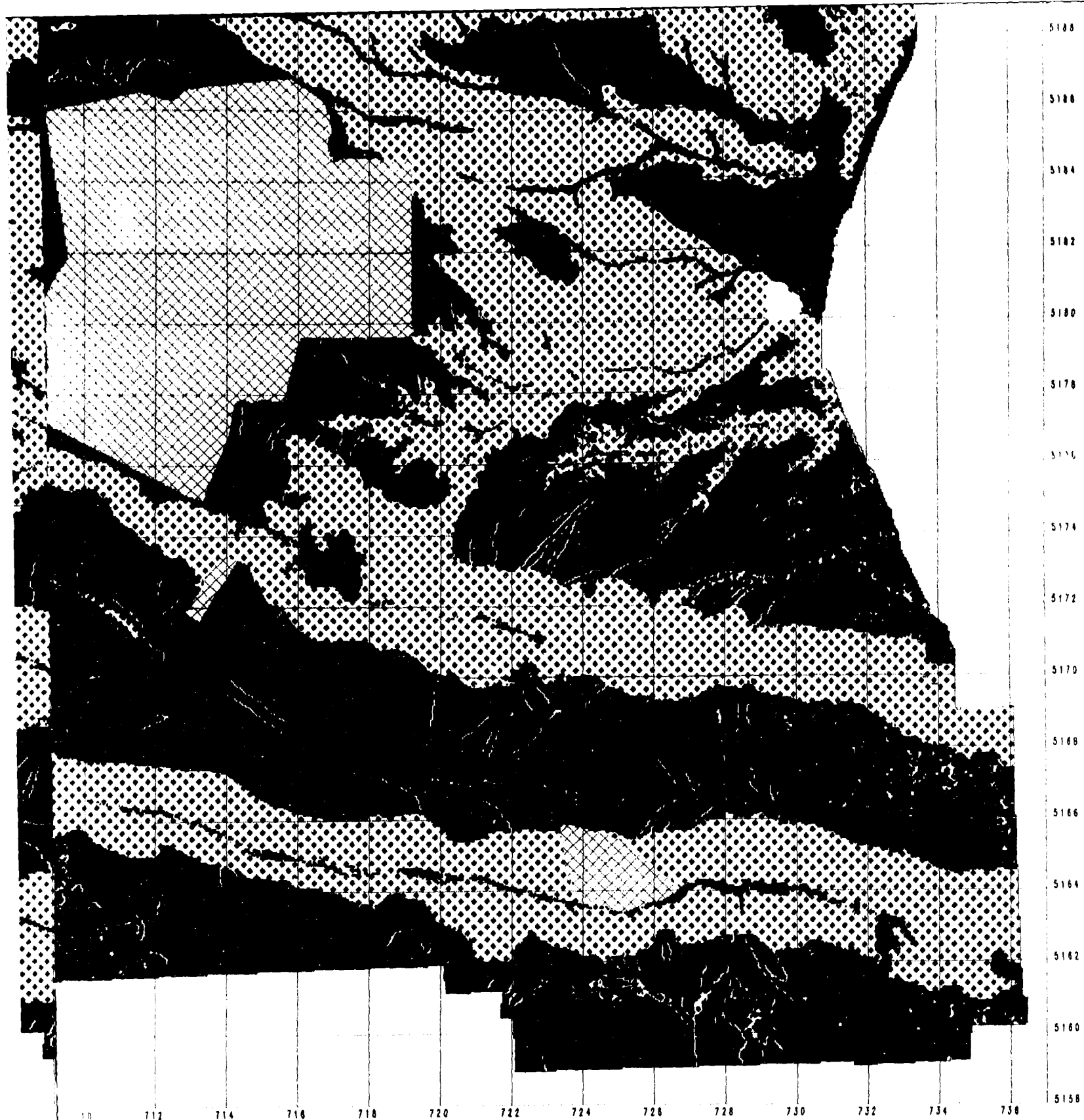
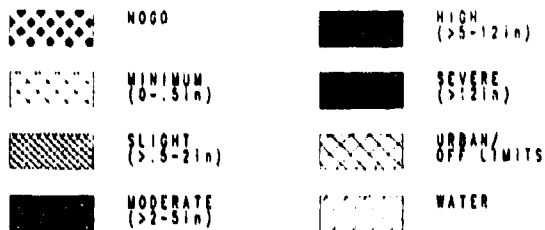
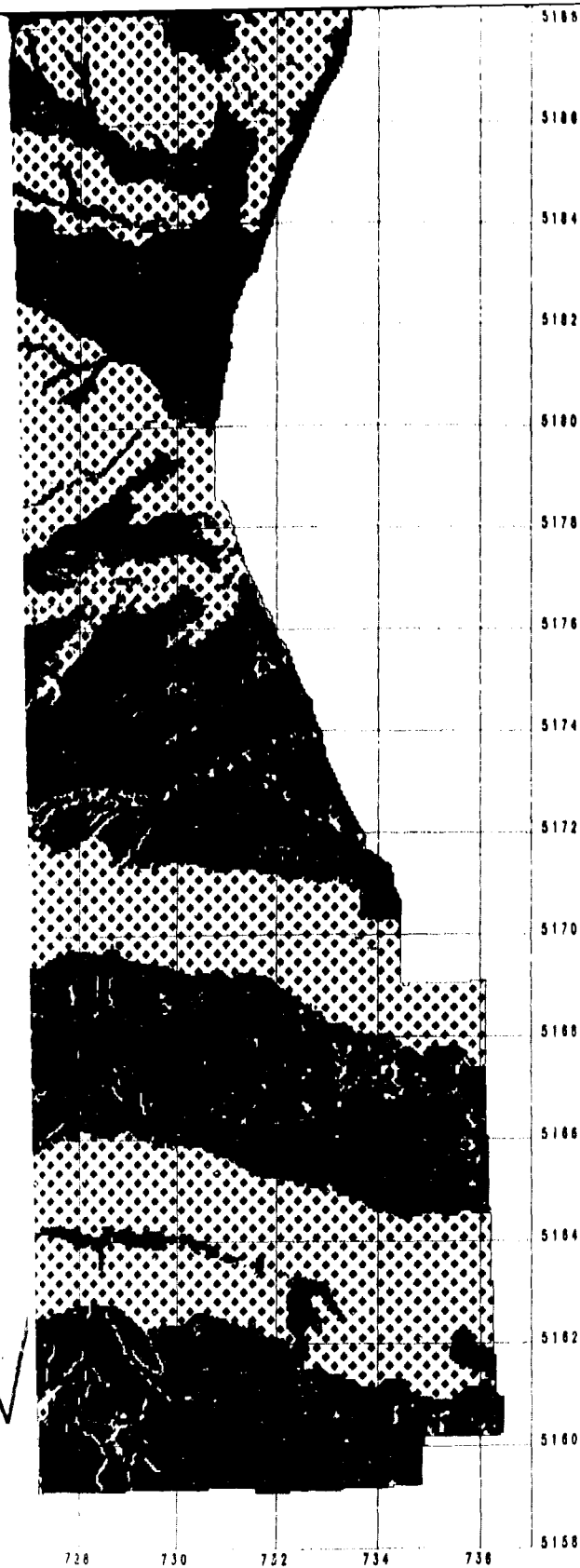
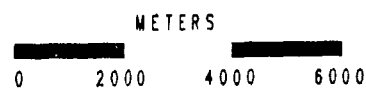


plate 31. Fifty pass soil disturbance level map for the 5-5-0 force structure in the wet-wet slippery surface condi

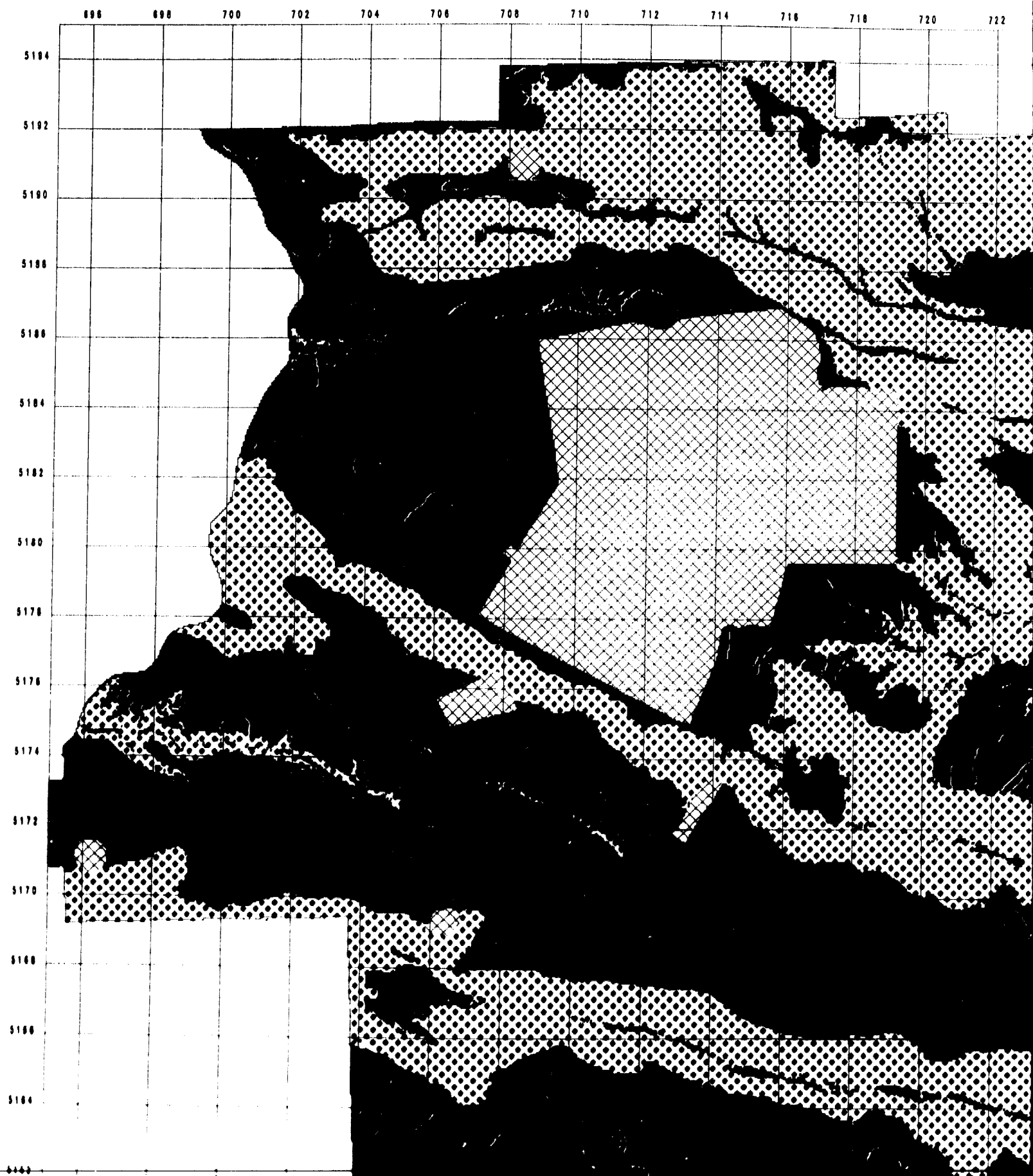


YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

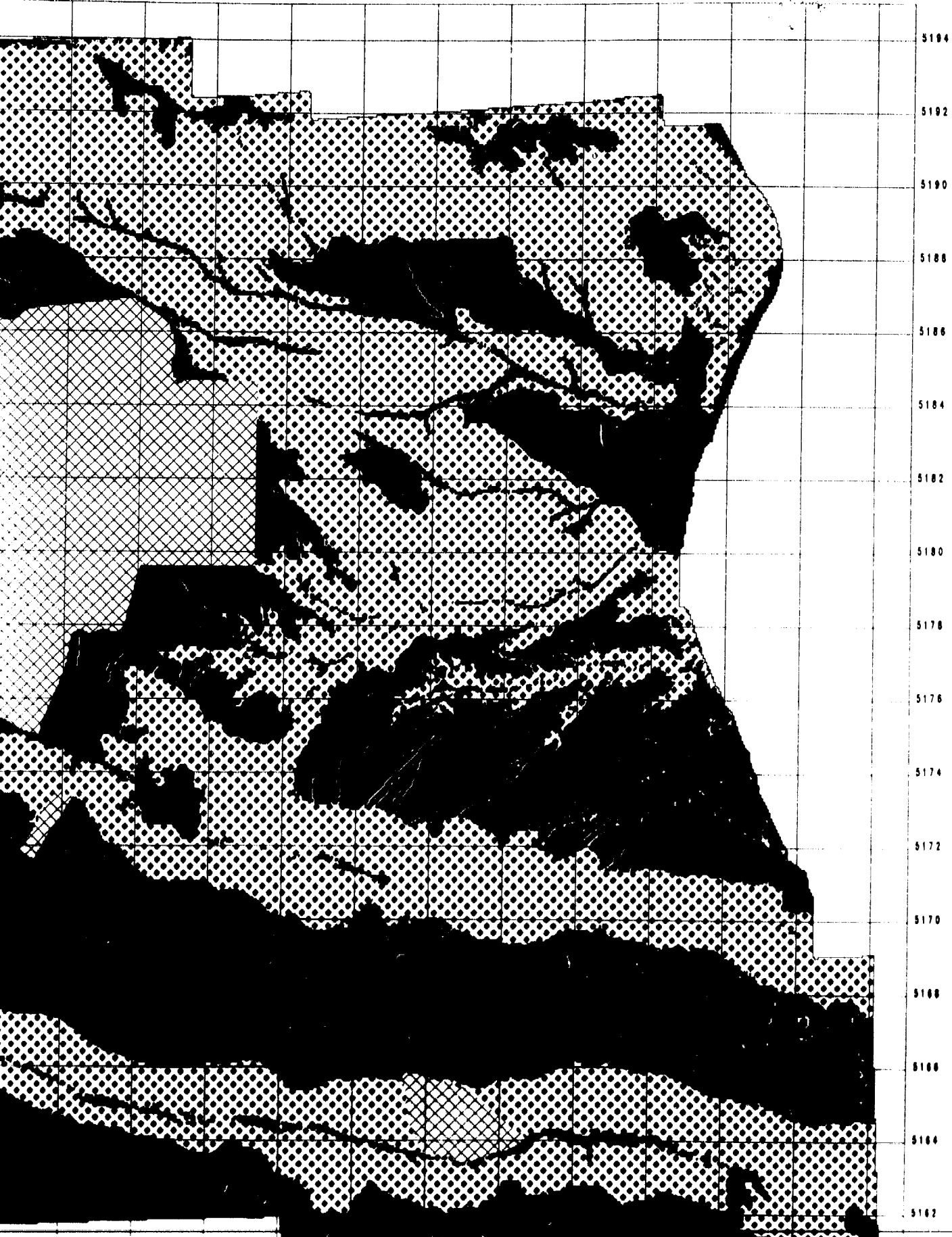


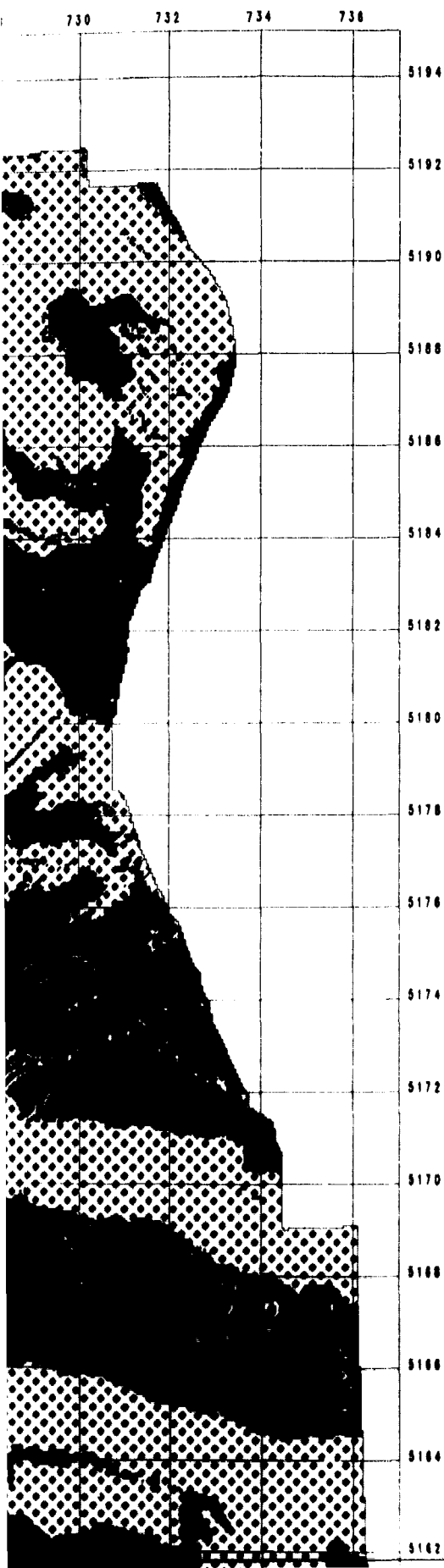
N

force structure in the wet-wet slippery surface condition



2 714 716 718 720 722 724 726 728 730 732 734 736





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS
SCALE 1:100000

	NOGO		HIGH (>5-12in)
	MINIMUM (0-.5in)		SEVERE (>12in)
	SLIGHT (.5-2in)		URBAN/ OFF LIMITS
	MODERATE (2-5in)		WATER

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

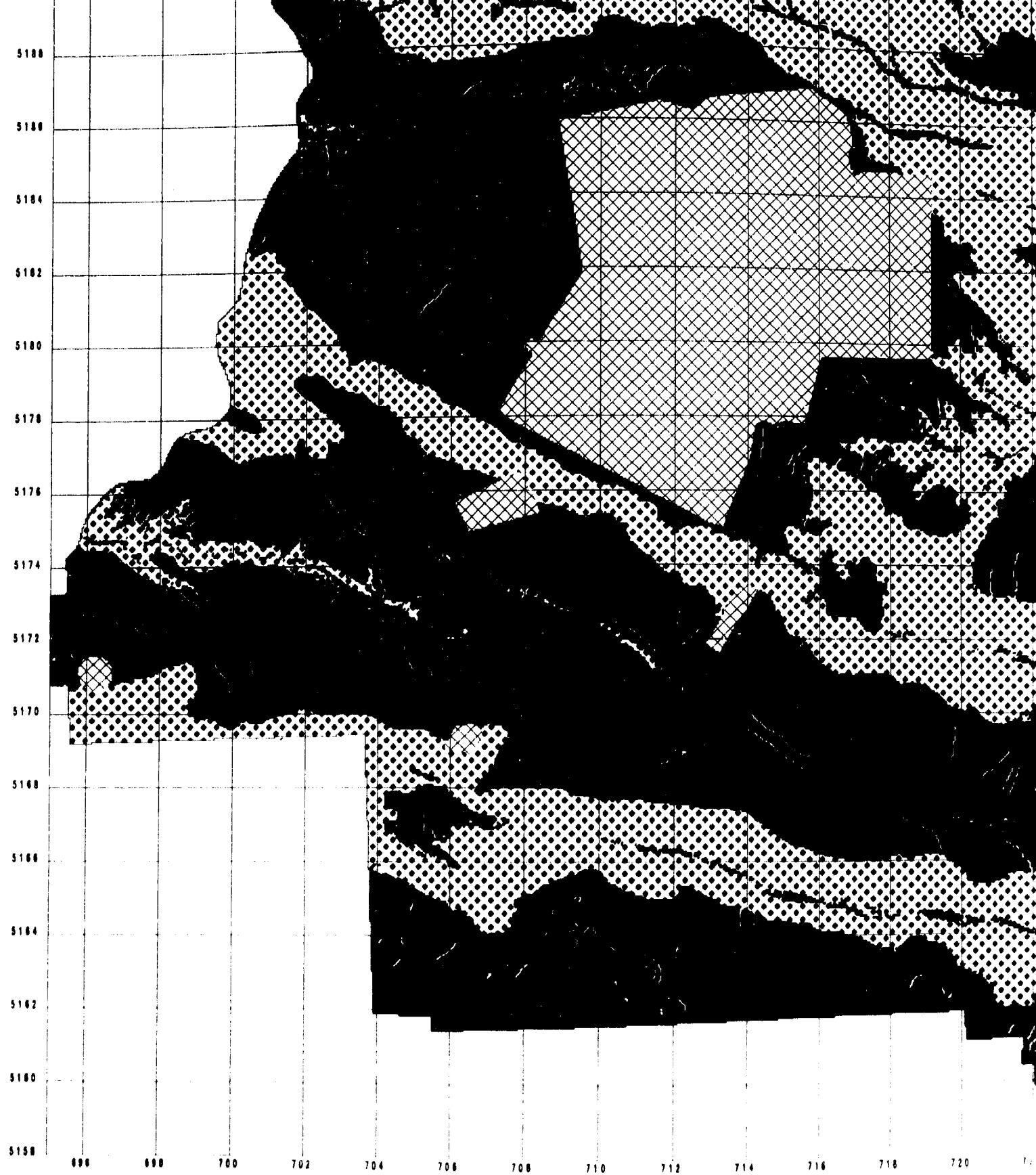


Plate 32. One thousand pass soil disturbance level

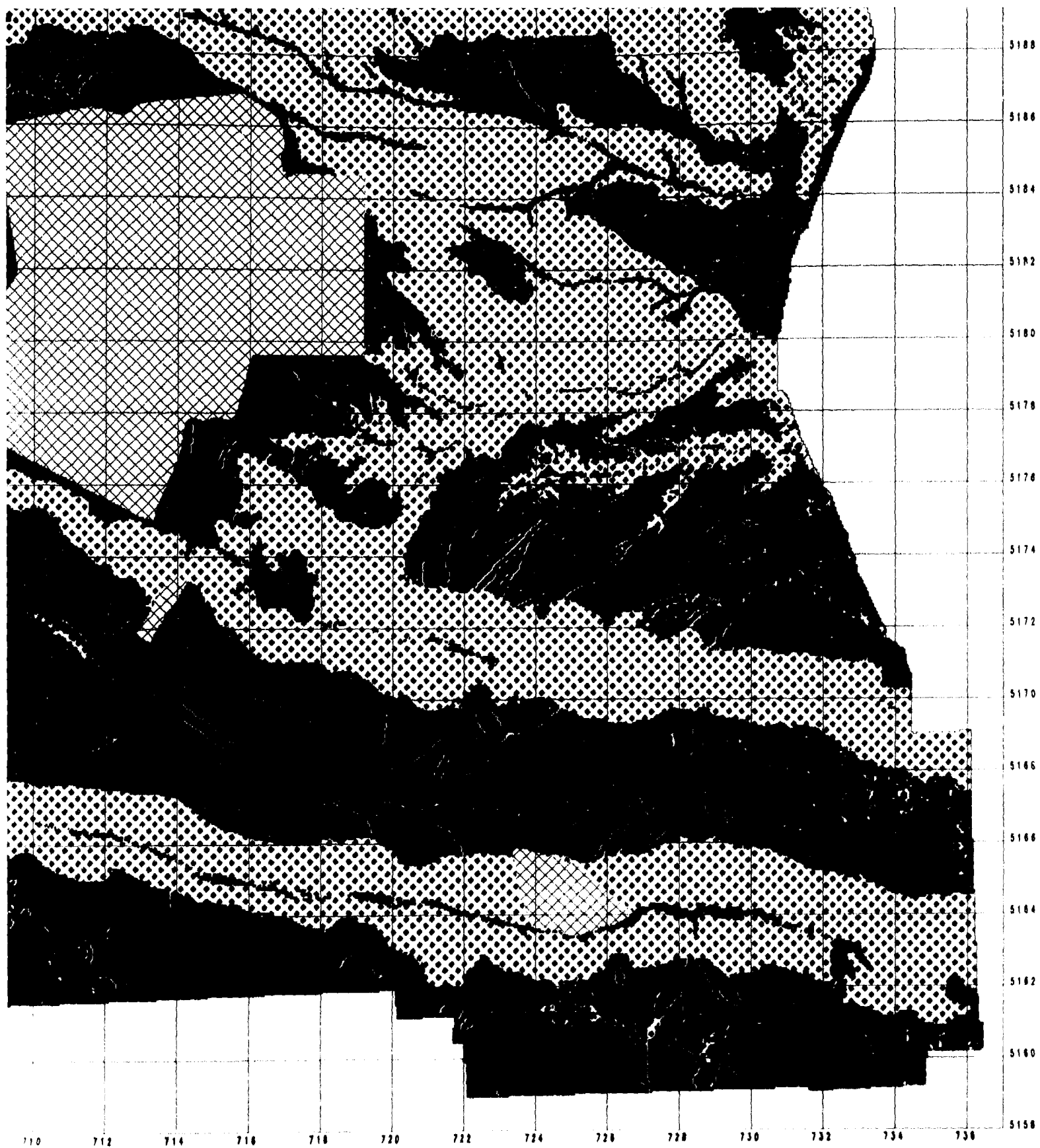
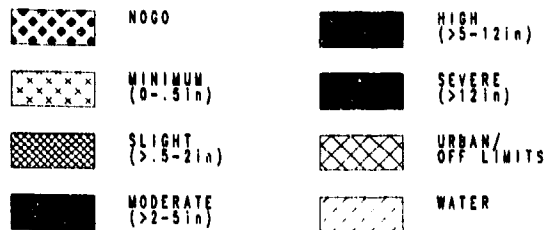
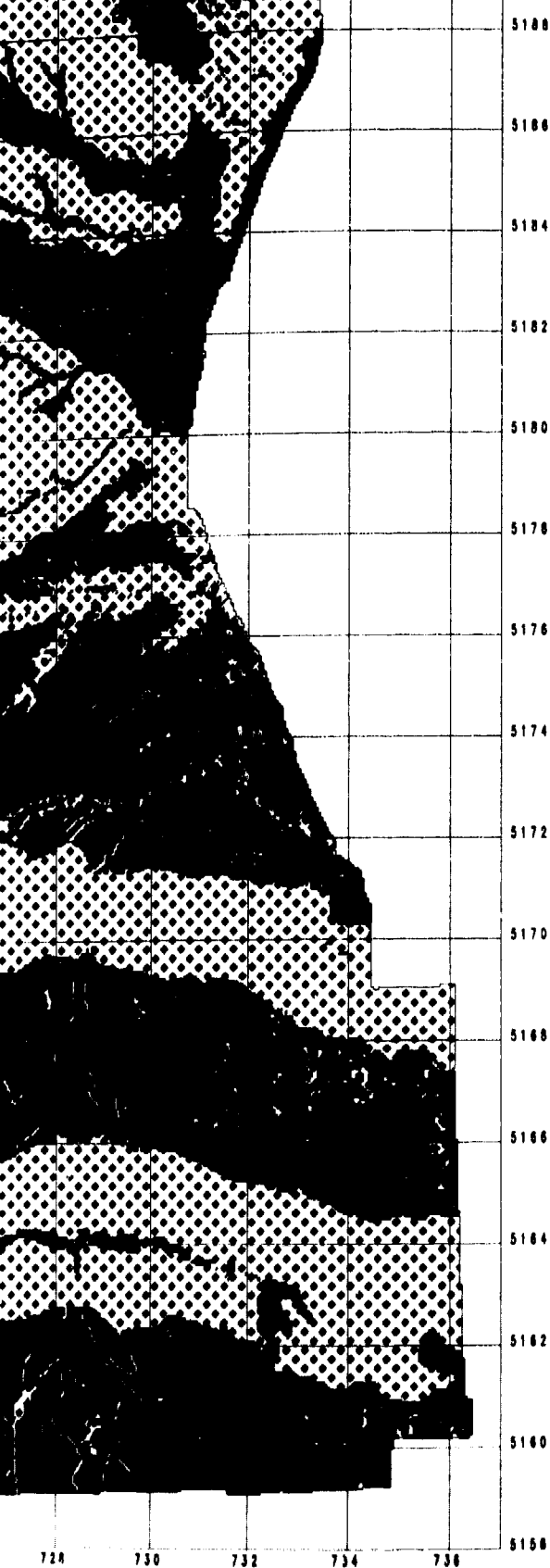
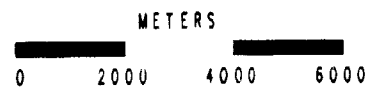


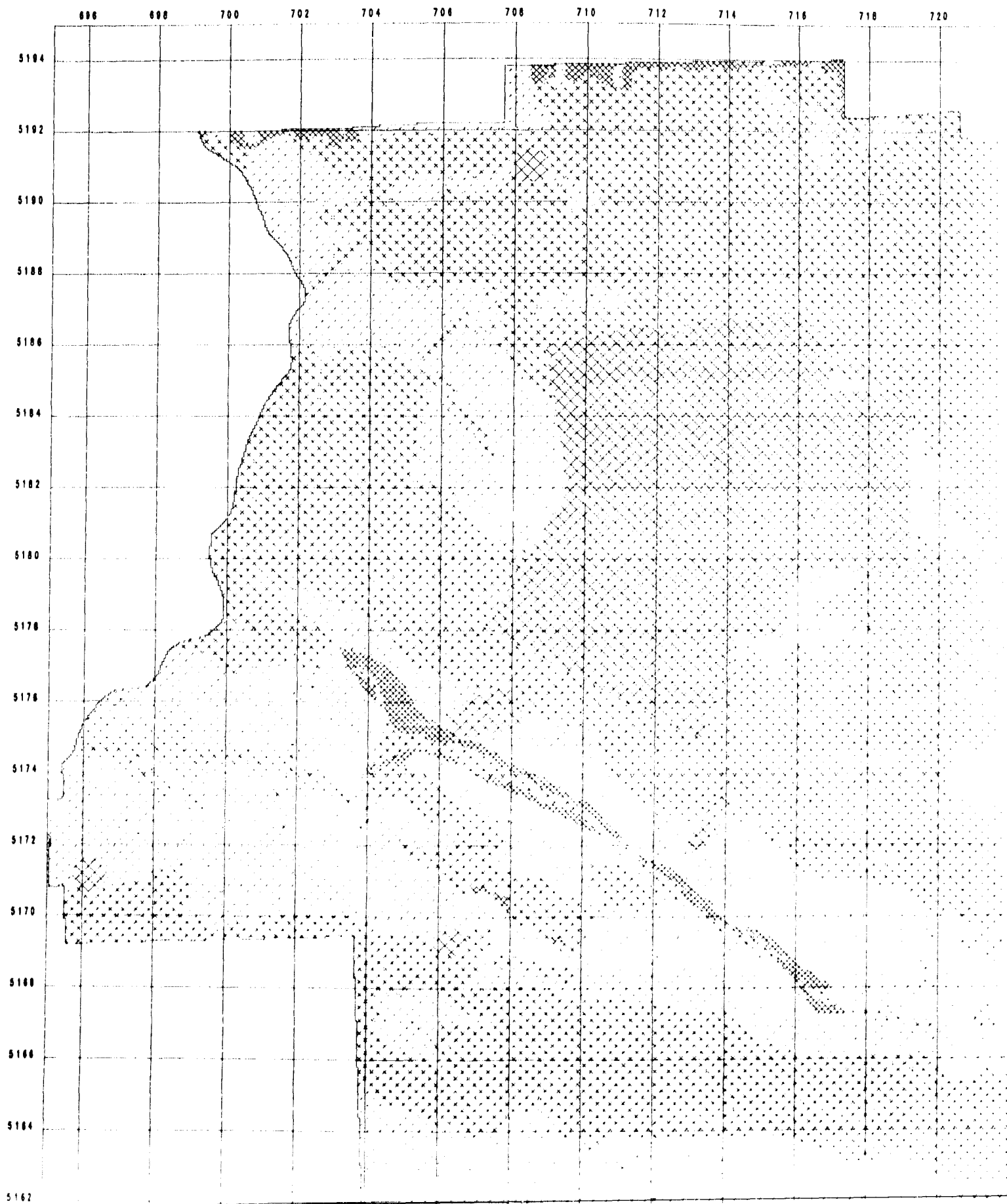
Plate 32. One thousand pass soil disturbance level map for the 5-5-0 force structure in the wet-wet slippery surface condition



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES



force structure in the wet-wet slippery surface condition



712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

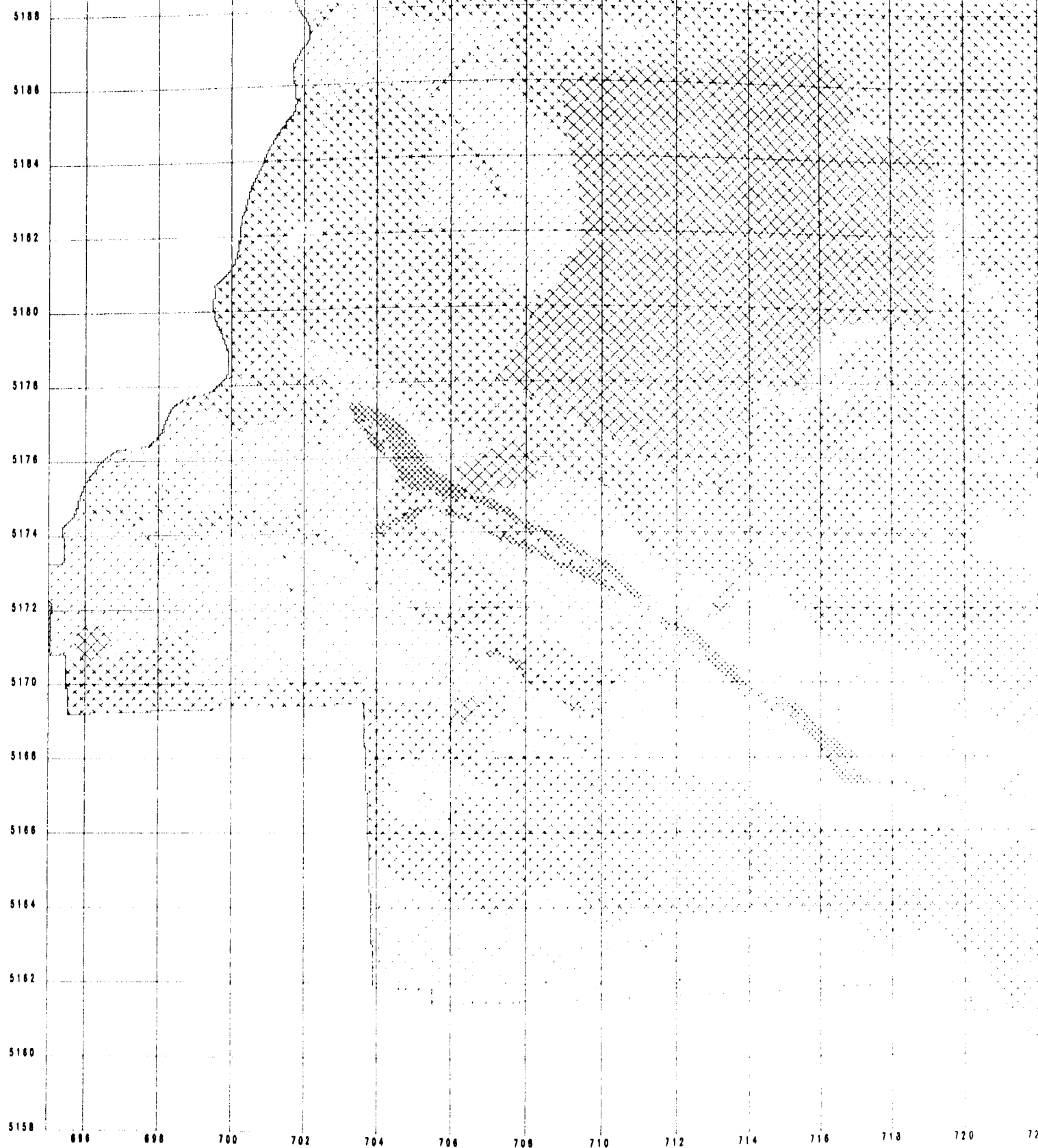


Plate 33. Rate of soil erosion for 3-3-5 a

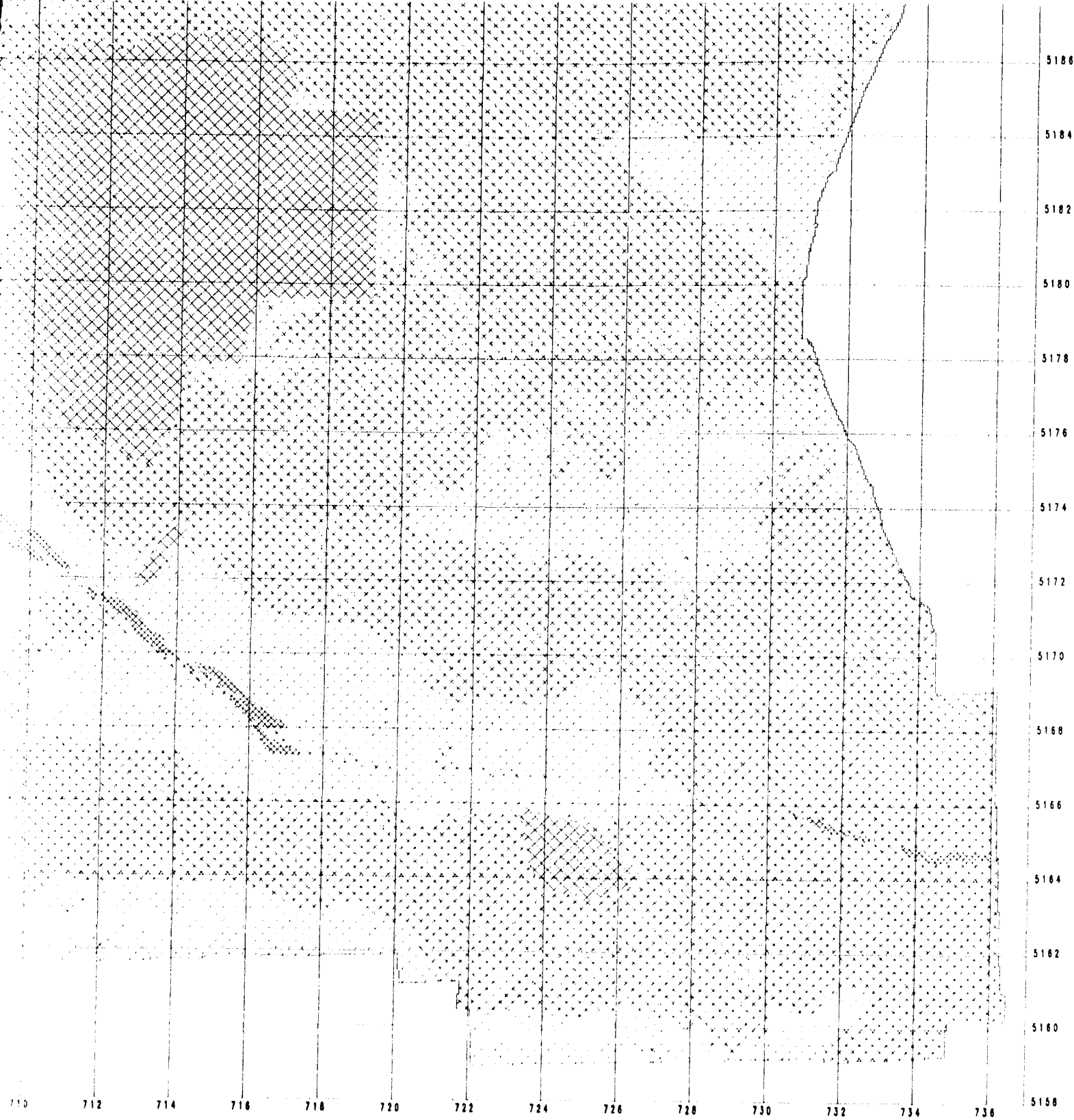
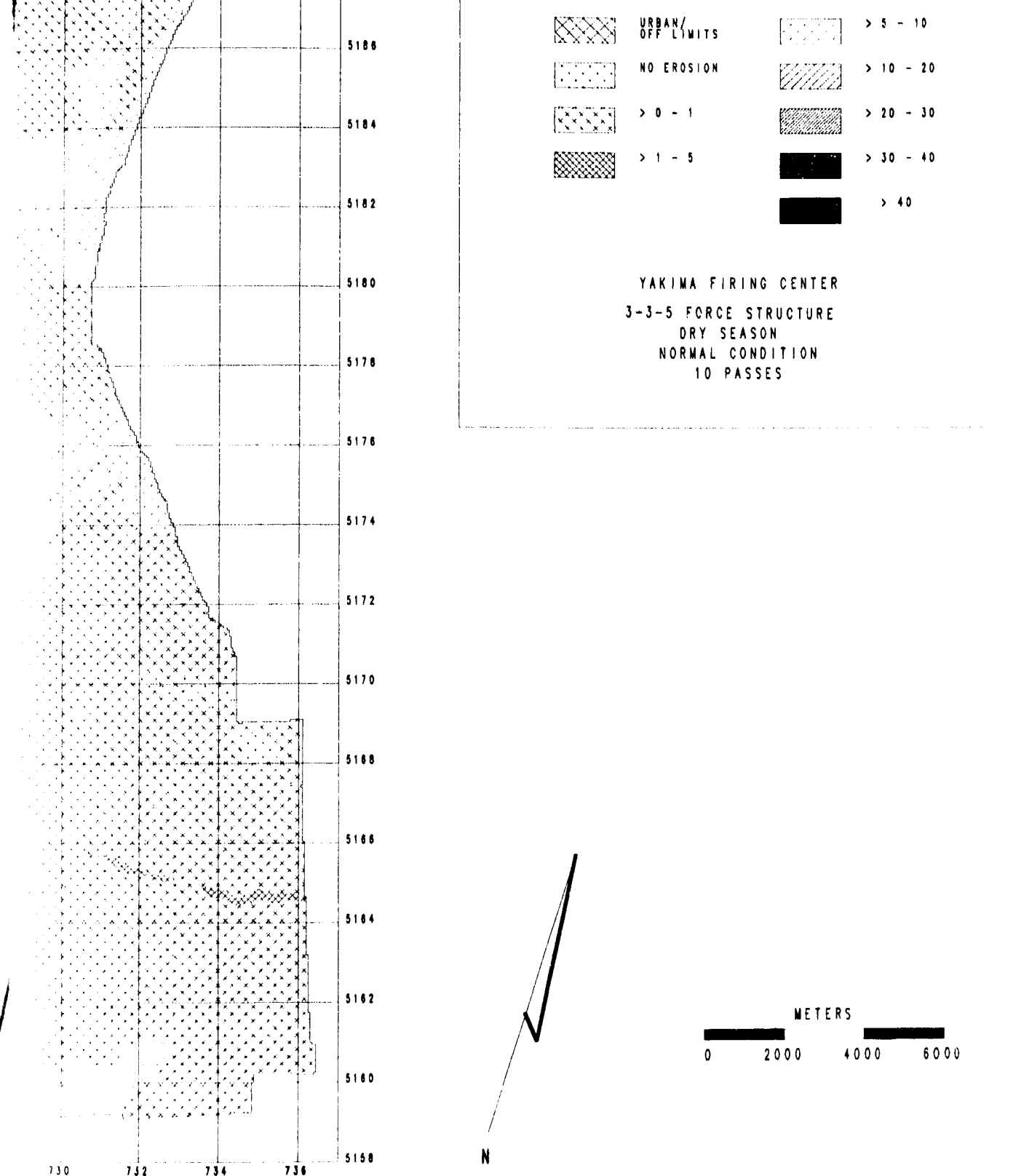
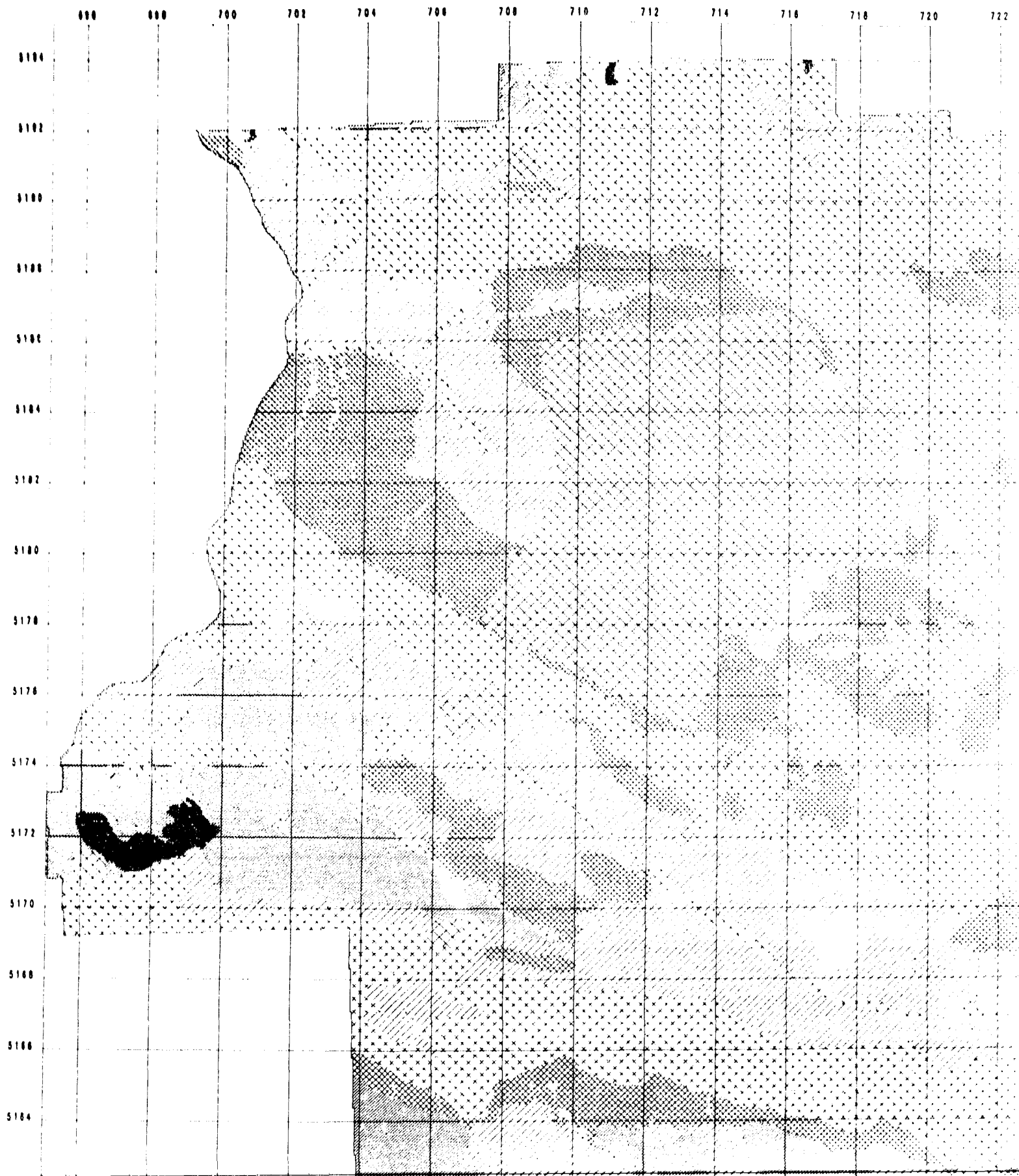
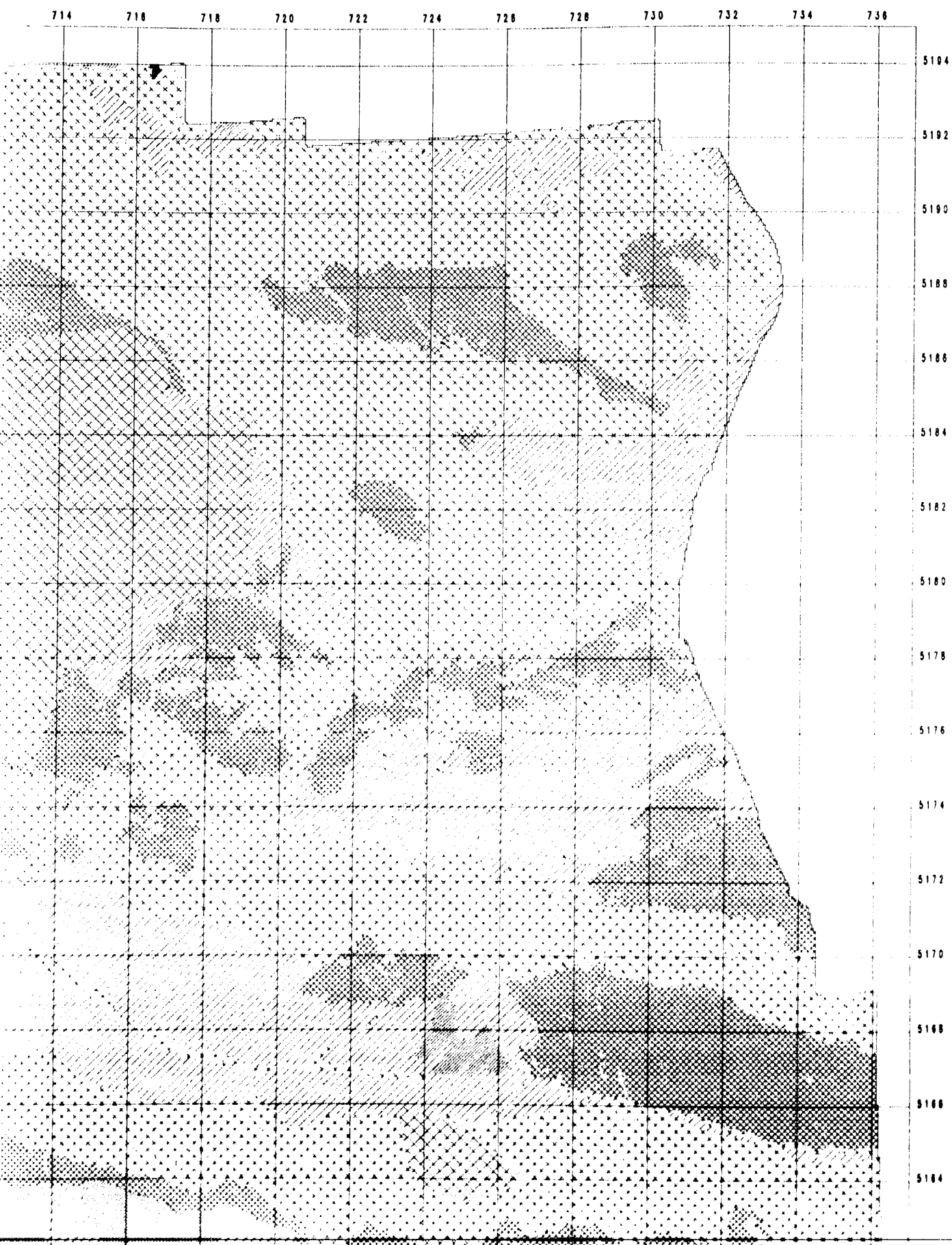


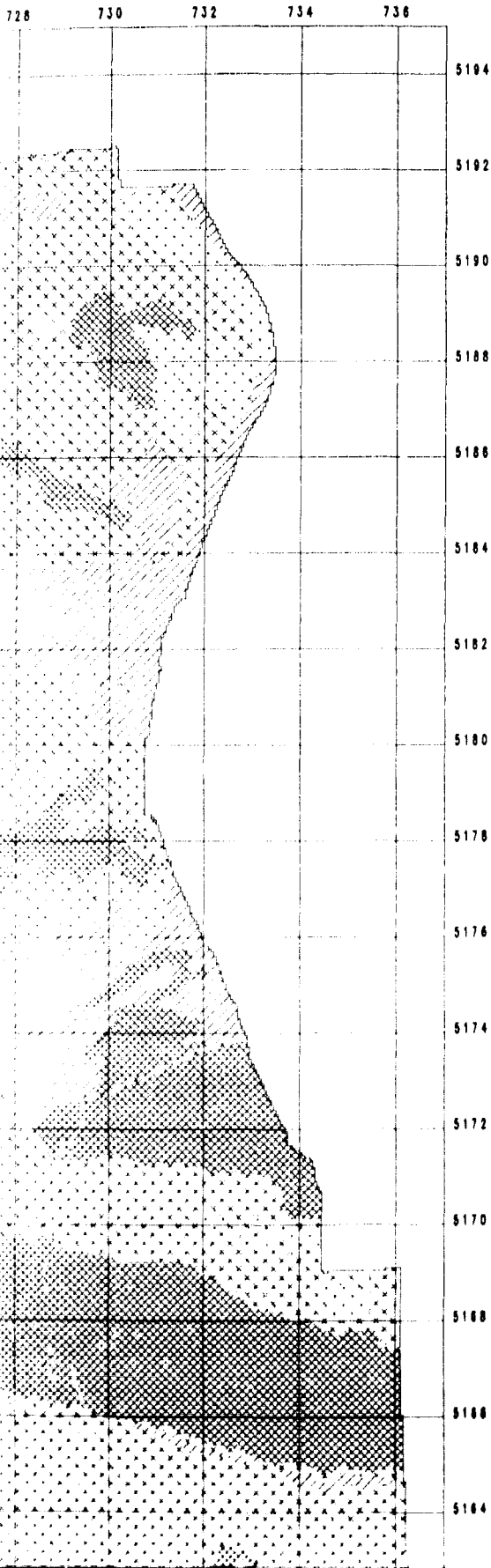
Plate 33. Rate of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition for te



a. Features in the dry normal surface condition for ten passes







U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

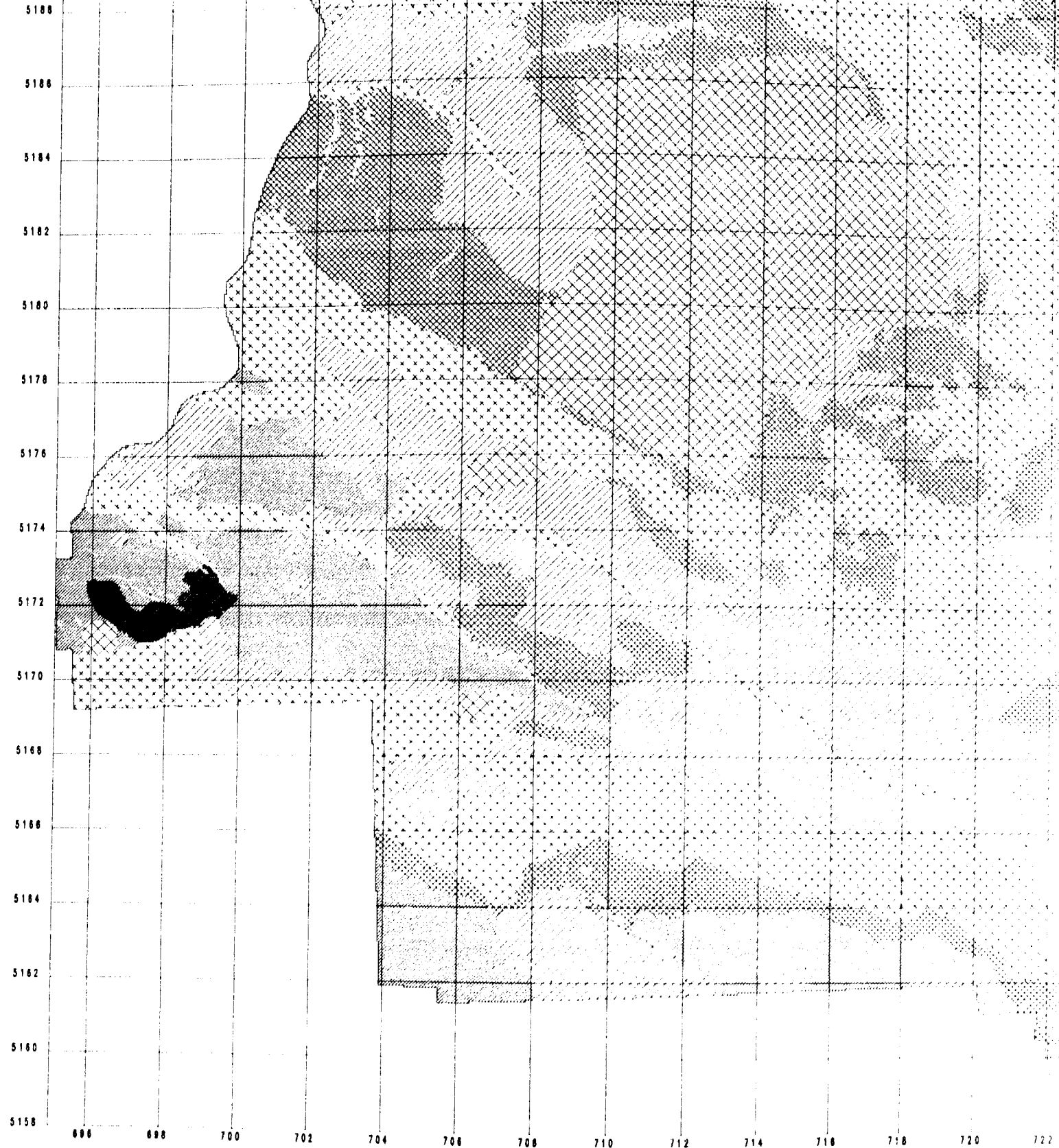


Plate 34. Rate of soil erosion for 3-3-5 and 4-3-3 (H

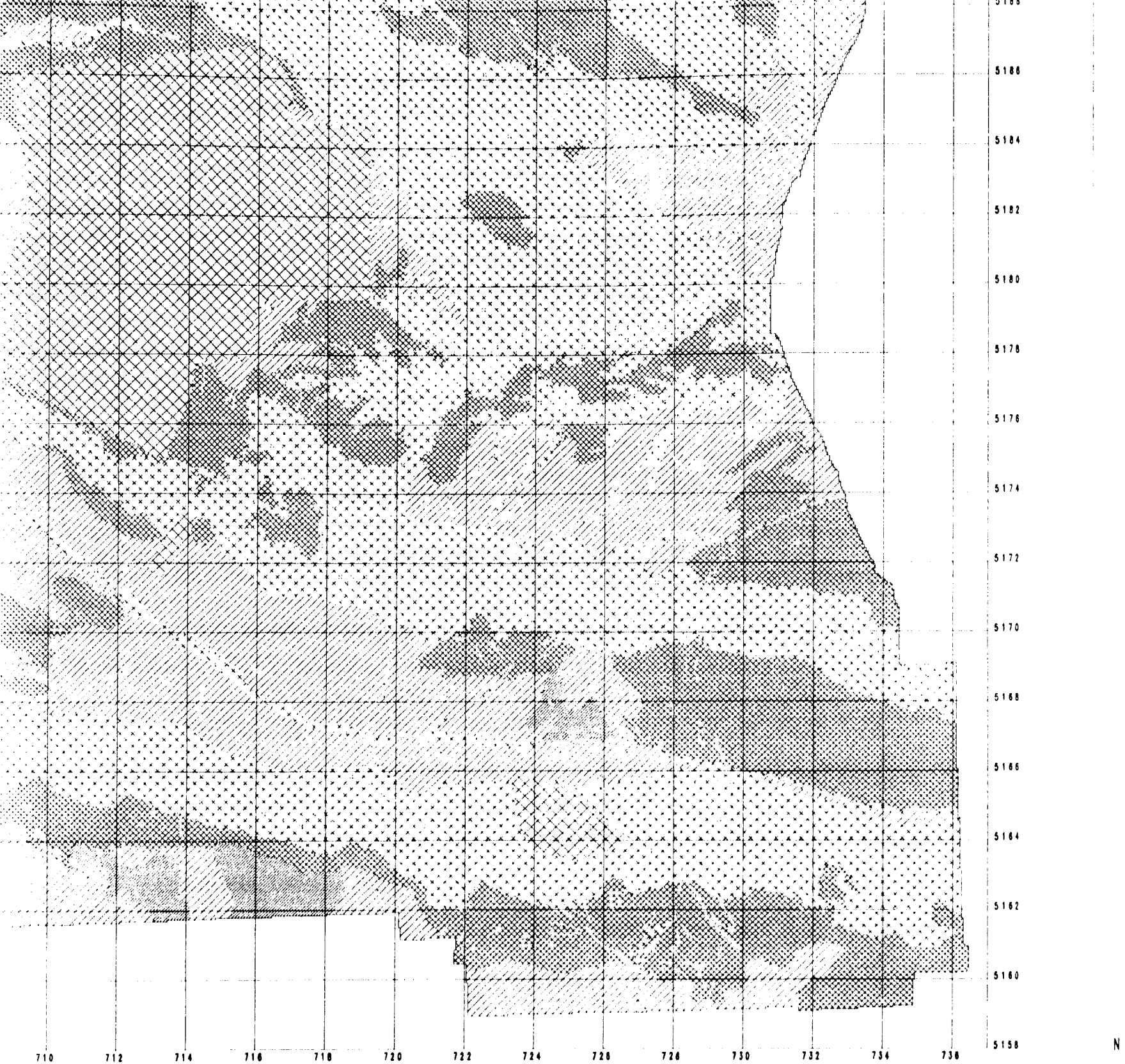
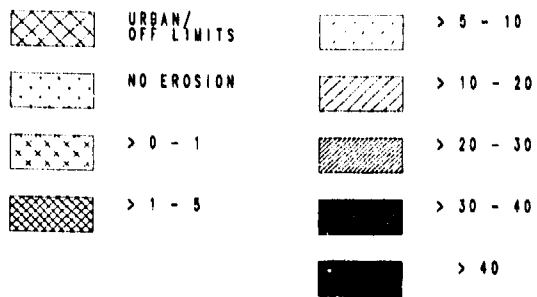
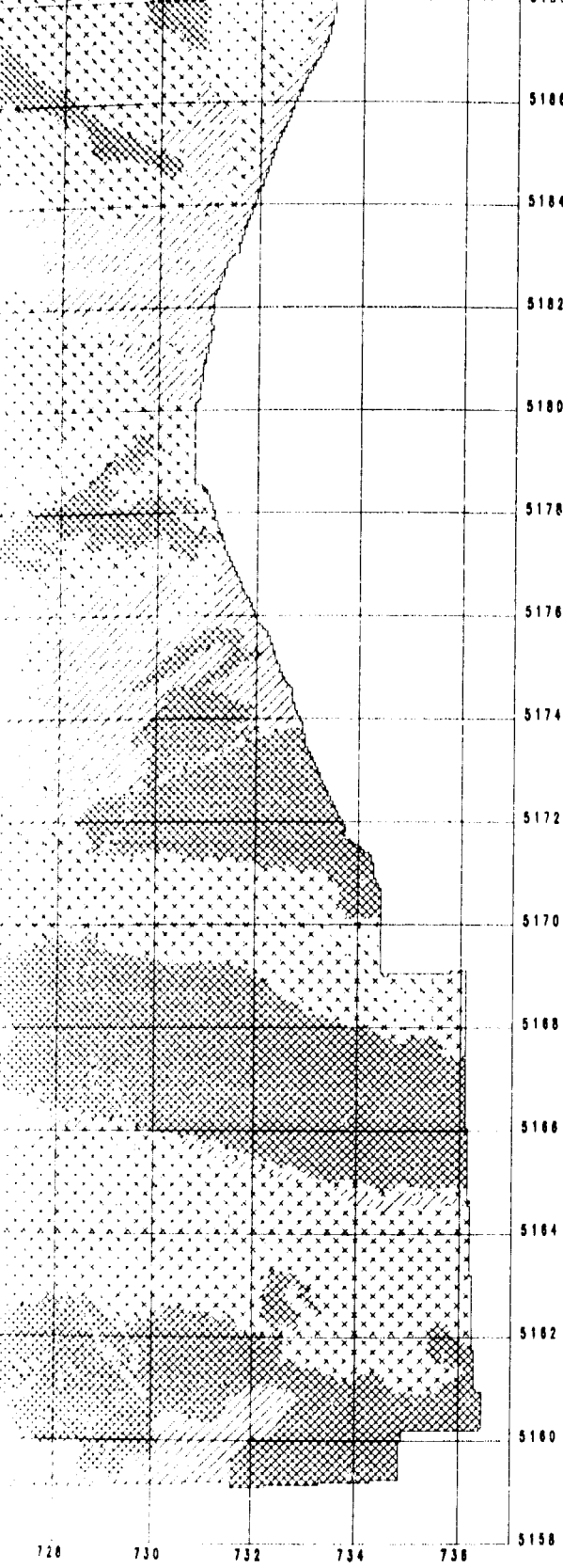
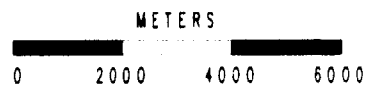


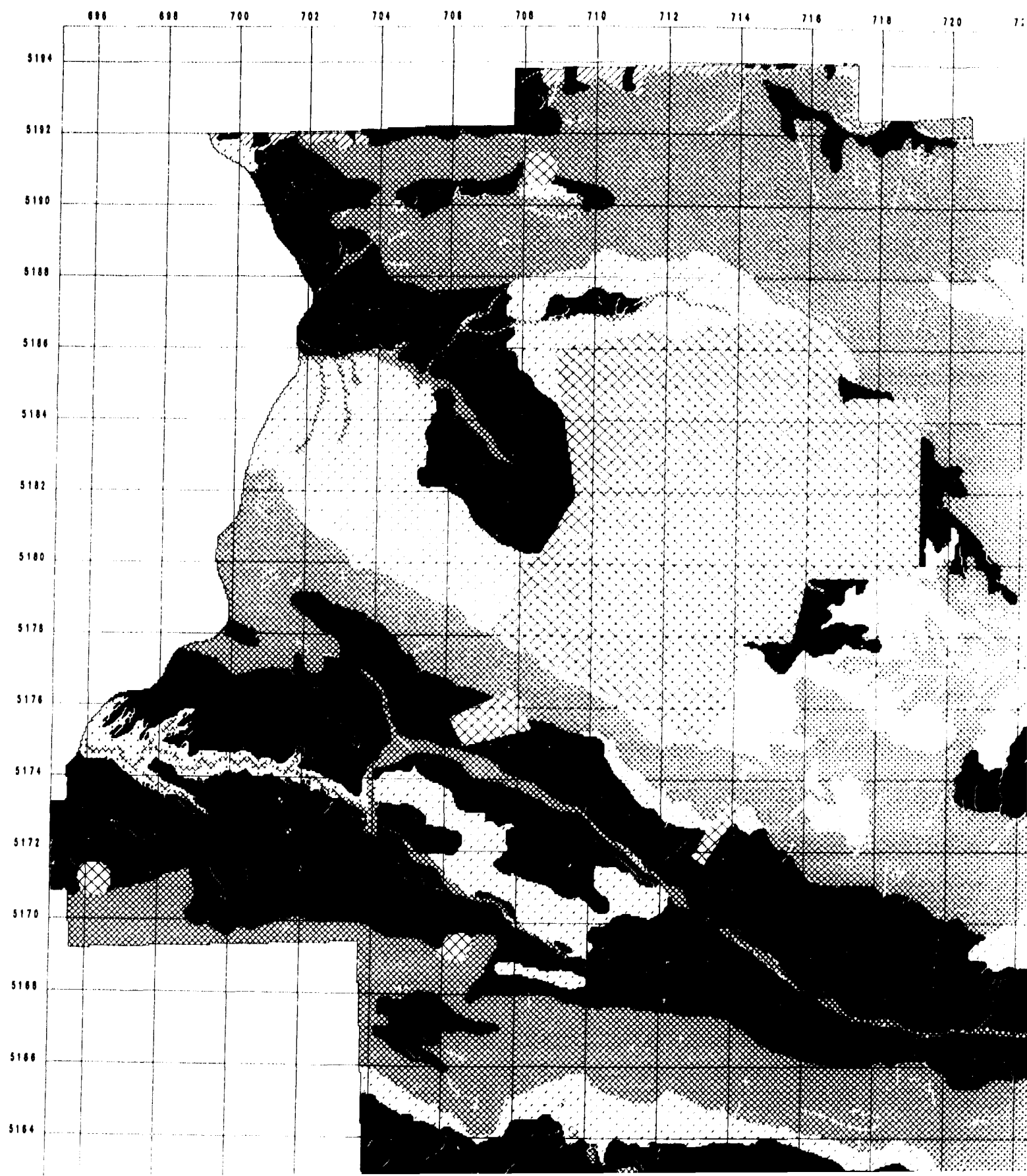
Plate 34. Rate of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition for fifty pass

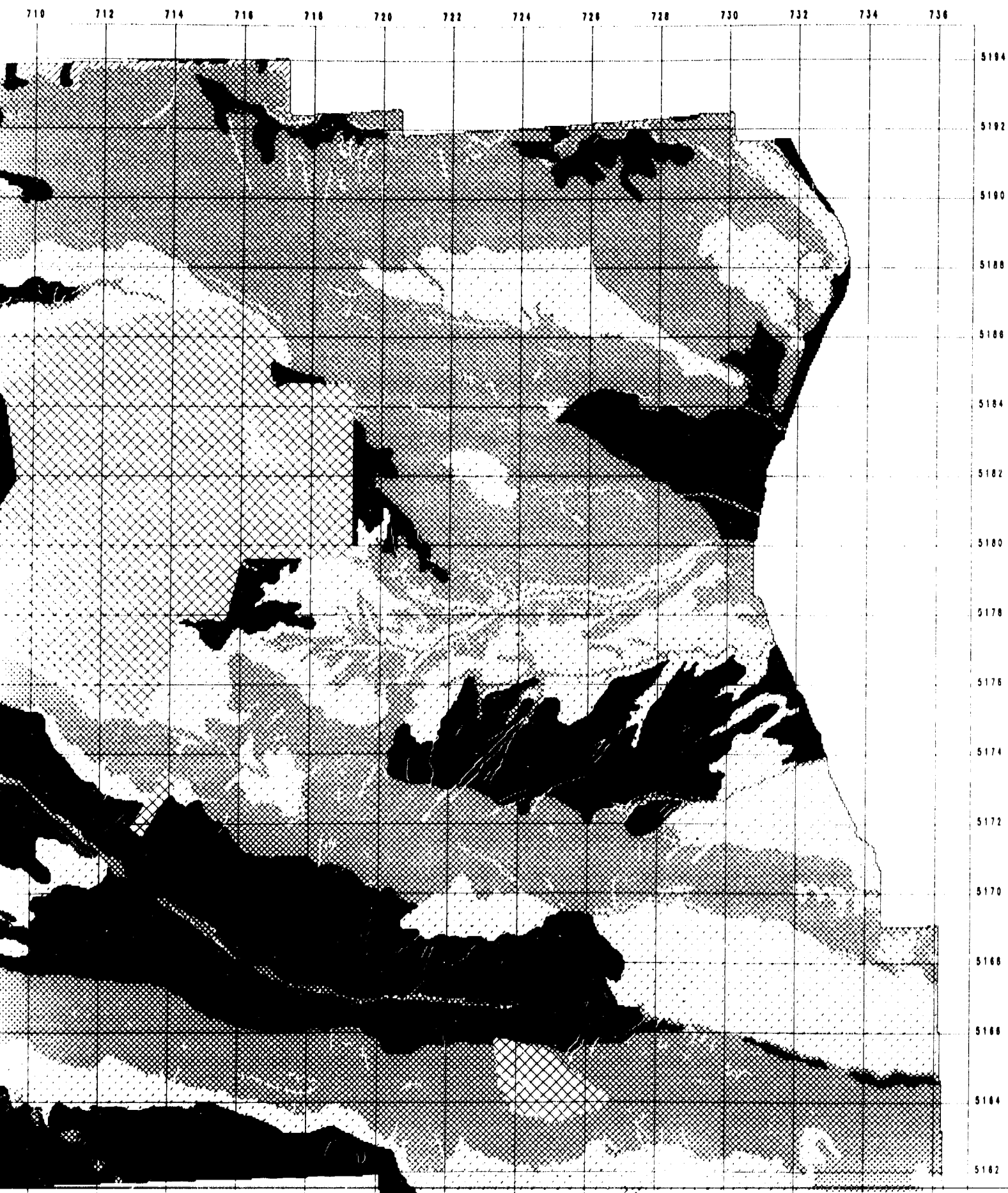


YAKIMA FIRING CENTER
 3-3-5 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 50 PASSES

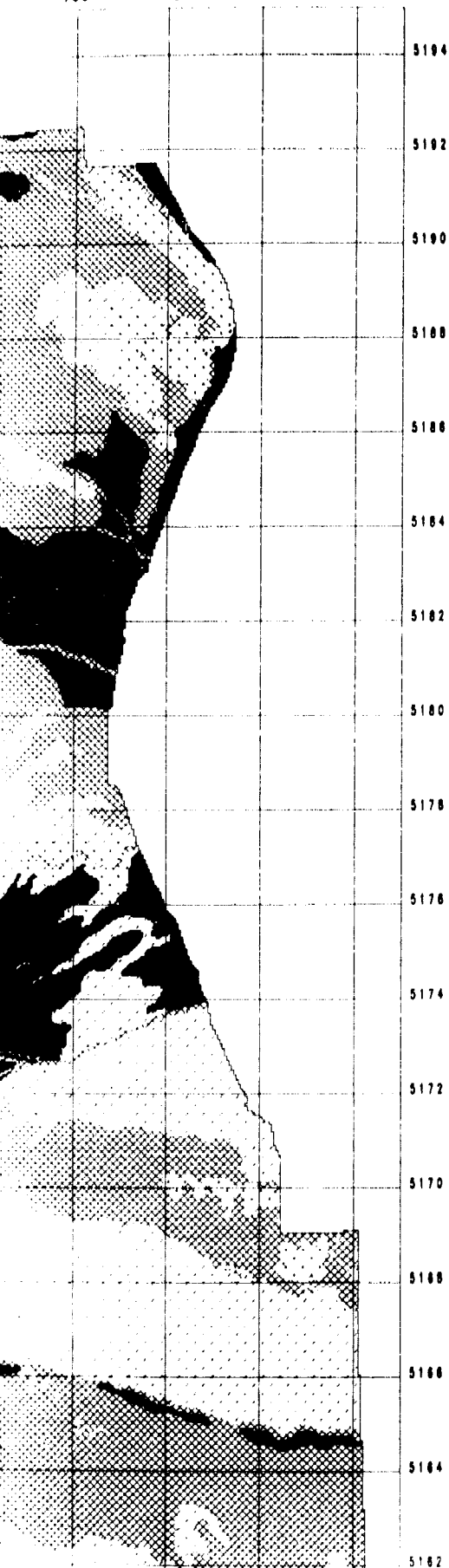


ures in the dry normal surface condition for fifty passes





730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

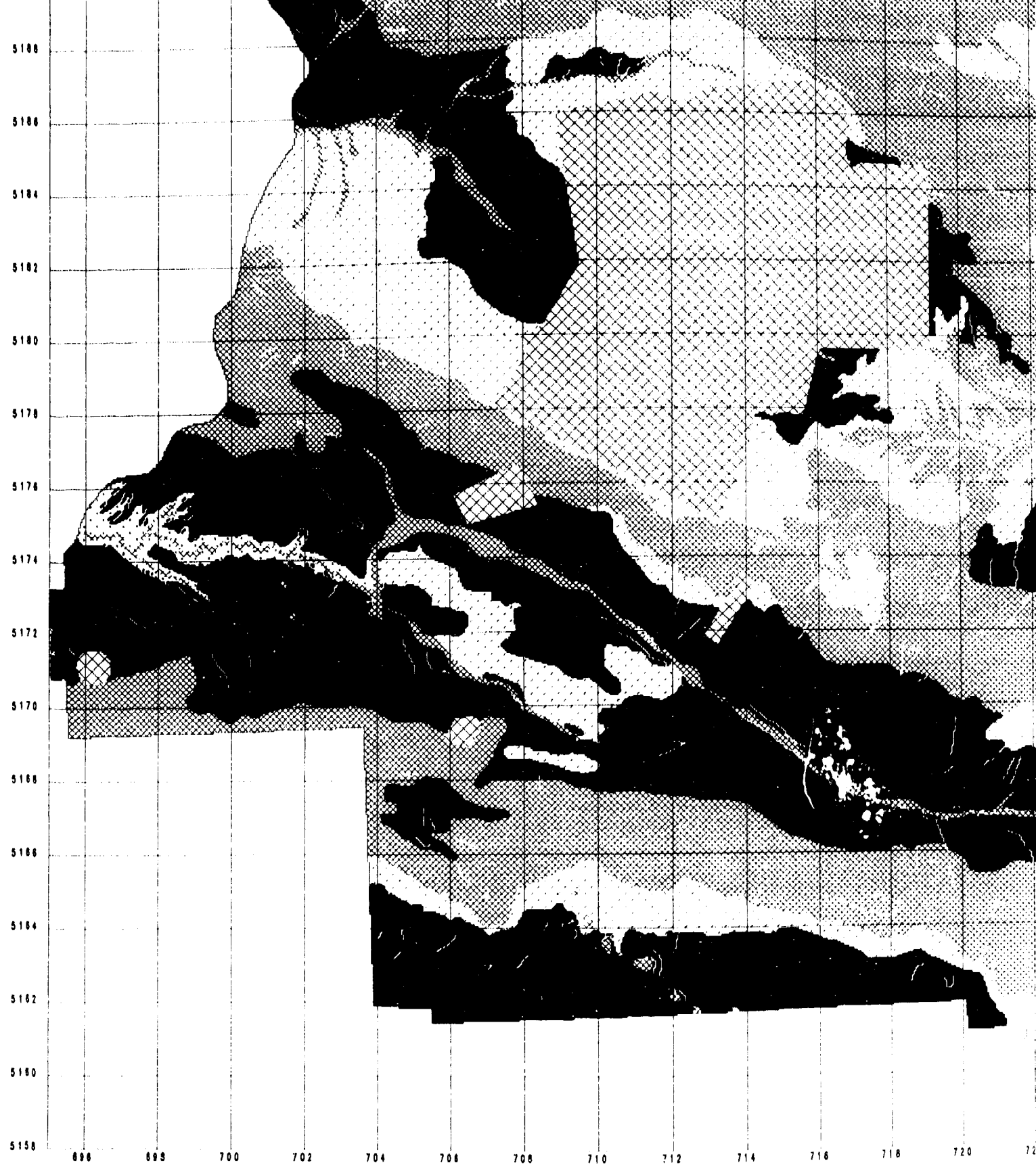
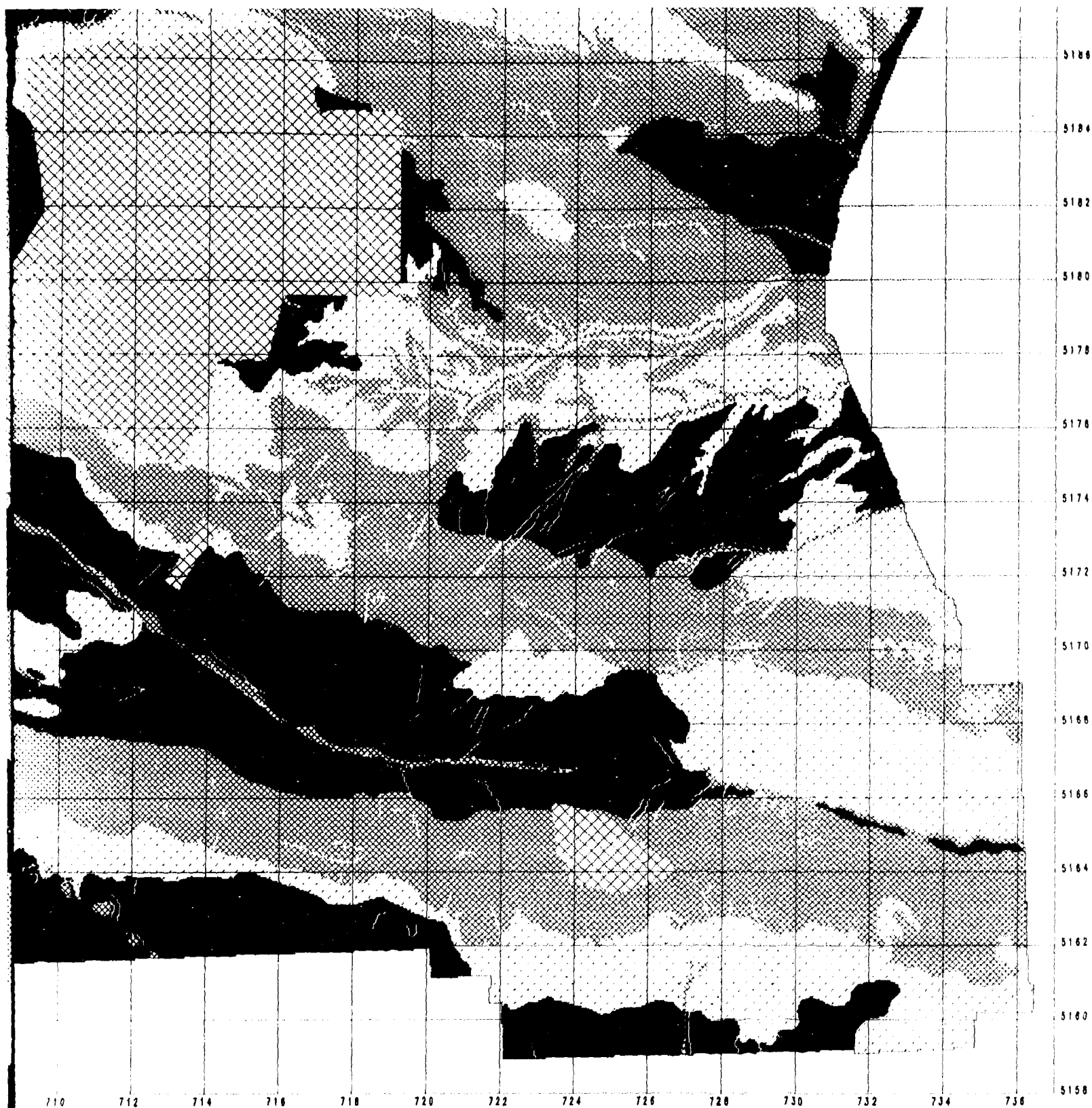
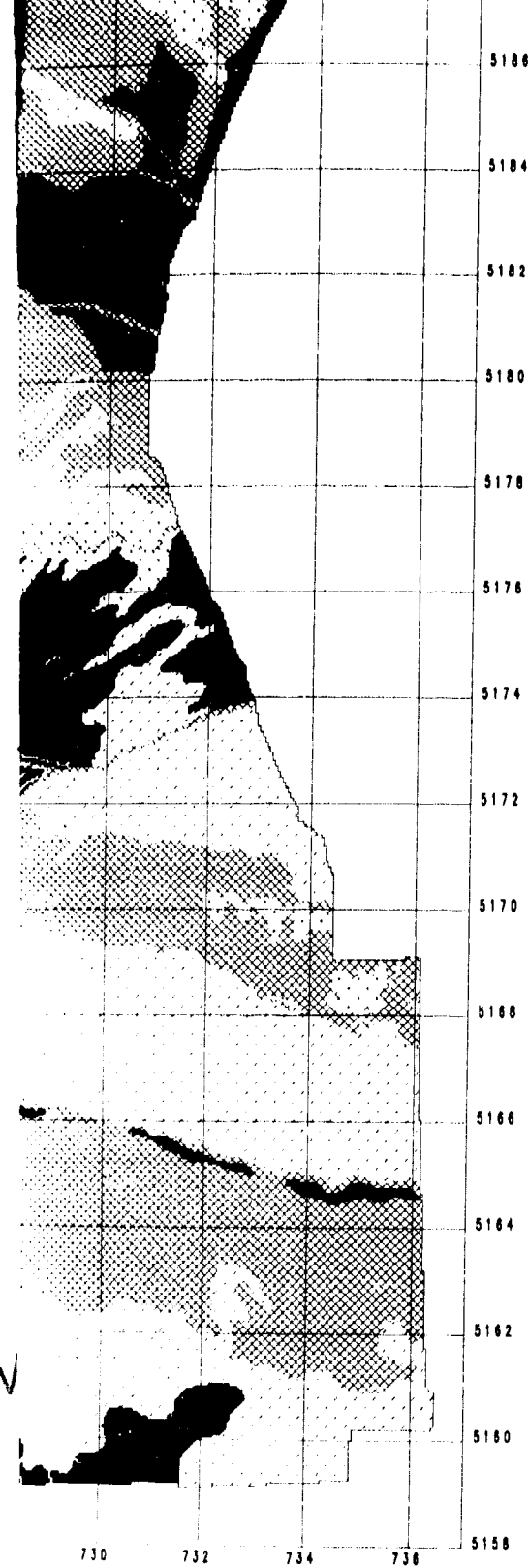


Plate 35. Rate of soil erosion for 3-3-5 and 4-3-3 (HMM)



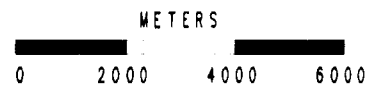
35. Rate of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition for one thousand g



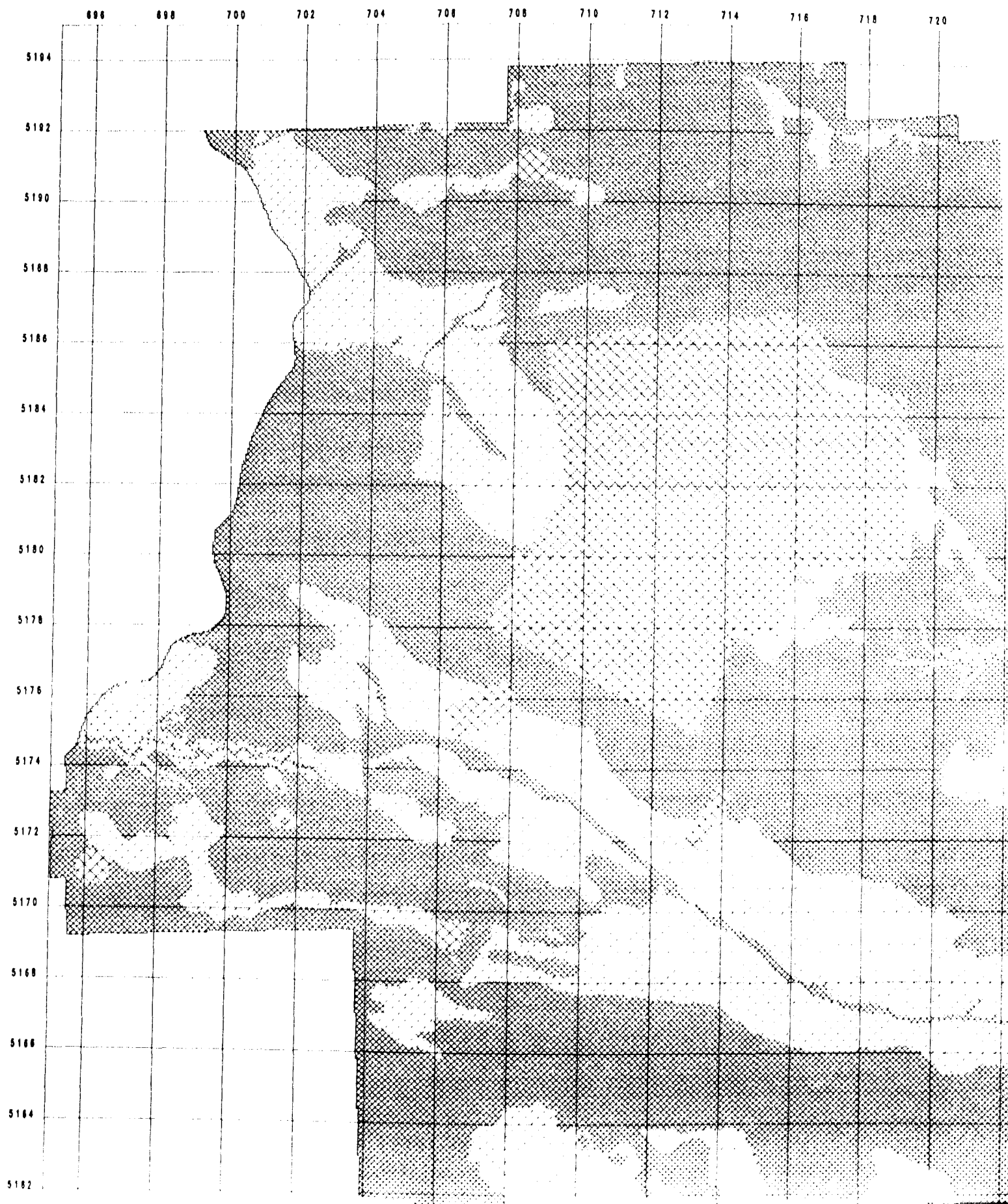
URBAN/
OFF LIMITS
 NO EROSION
 > 0 - 1
 > 1 - 5

> 5 - 10
 > 10 - 20
 > 20 - 30
 > 30 - 40
 > 40

YAKIMA FIRING CENTER
 3-3-5 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 1000 PASSES



dry normal surface condition for one thousand passes



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



736 732 734 738

5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164

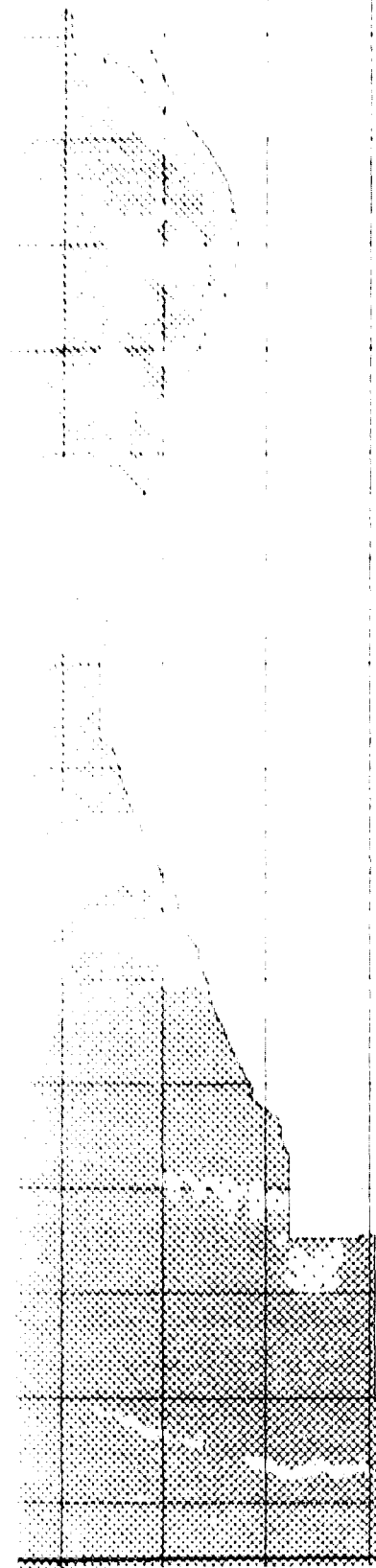


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES



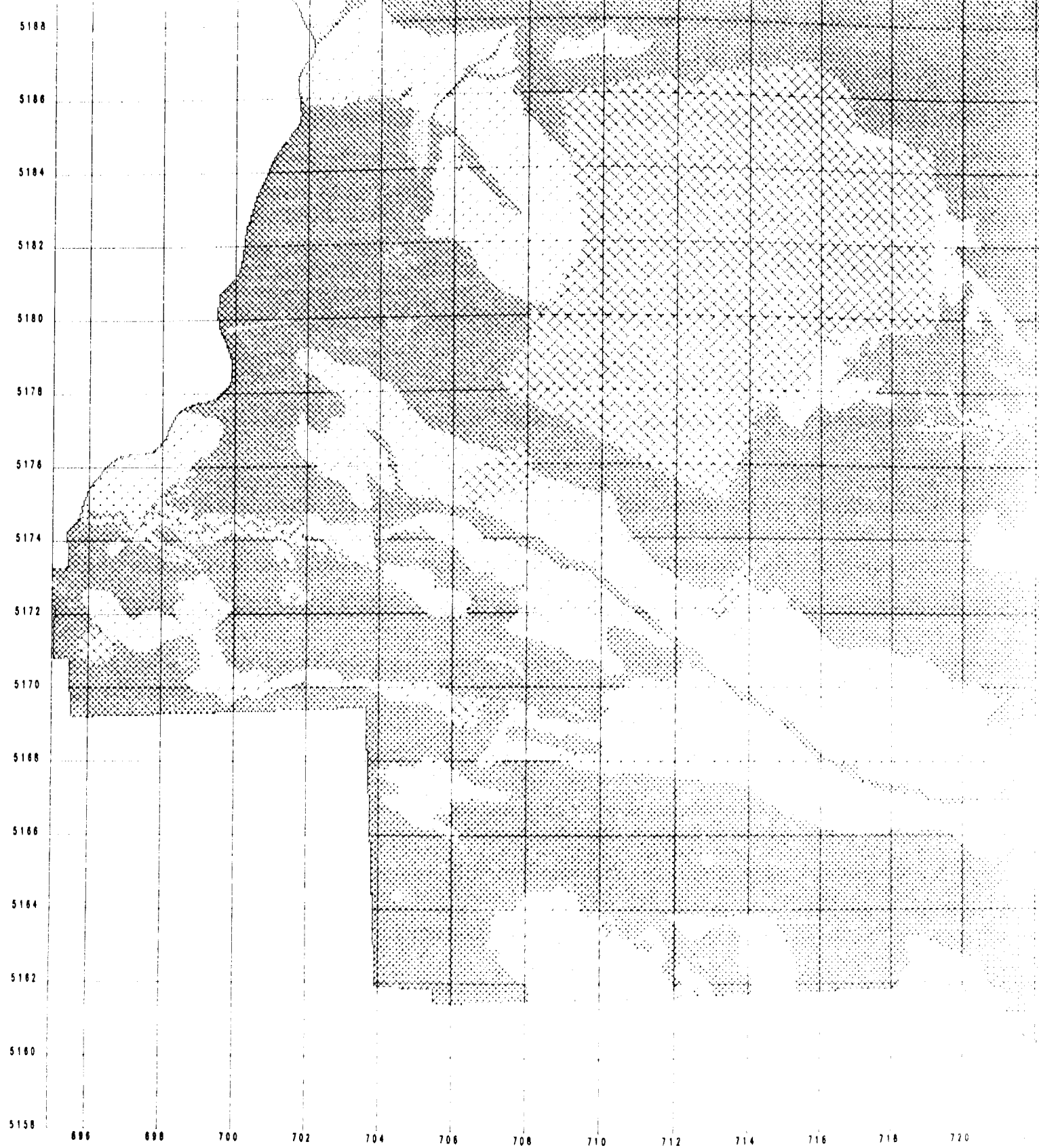
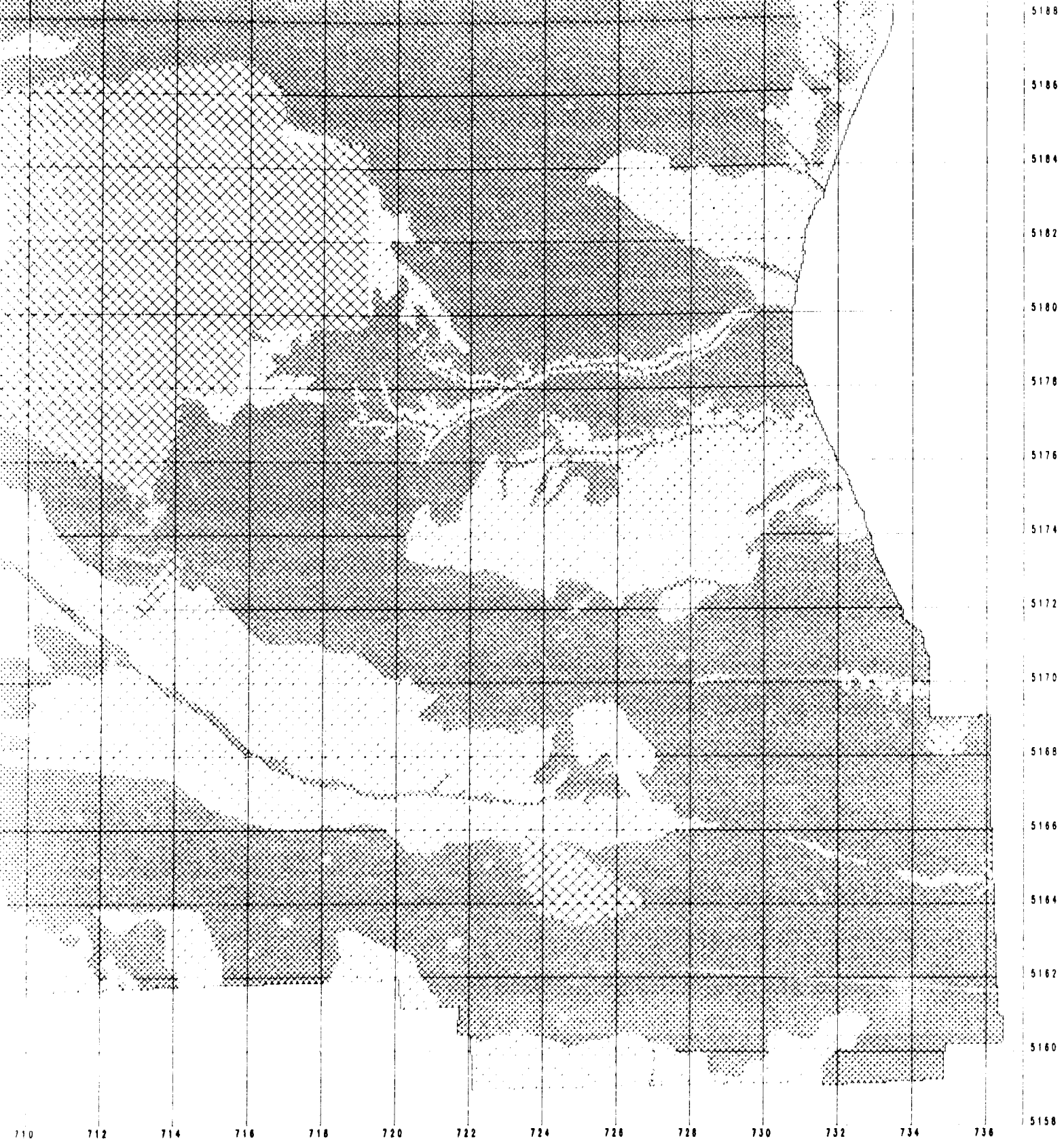
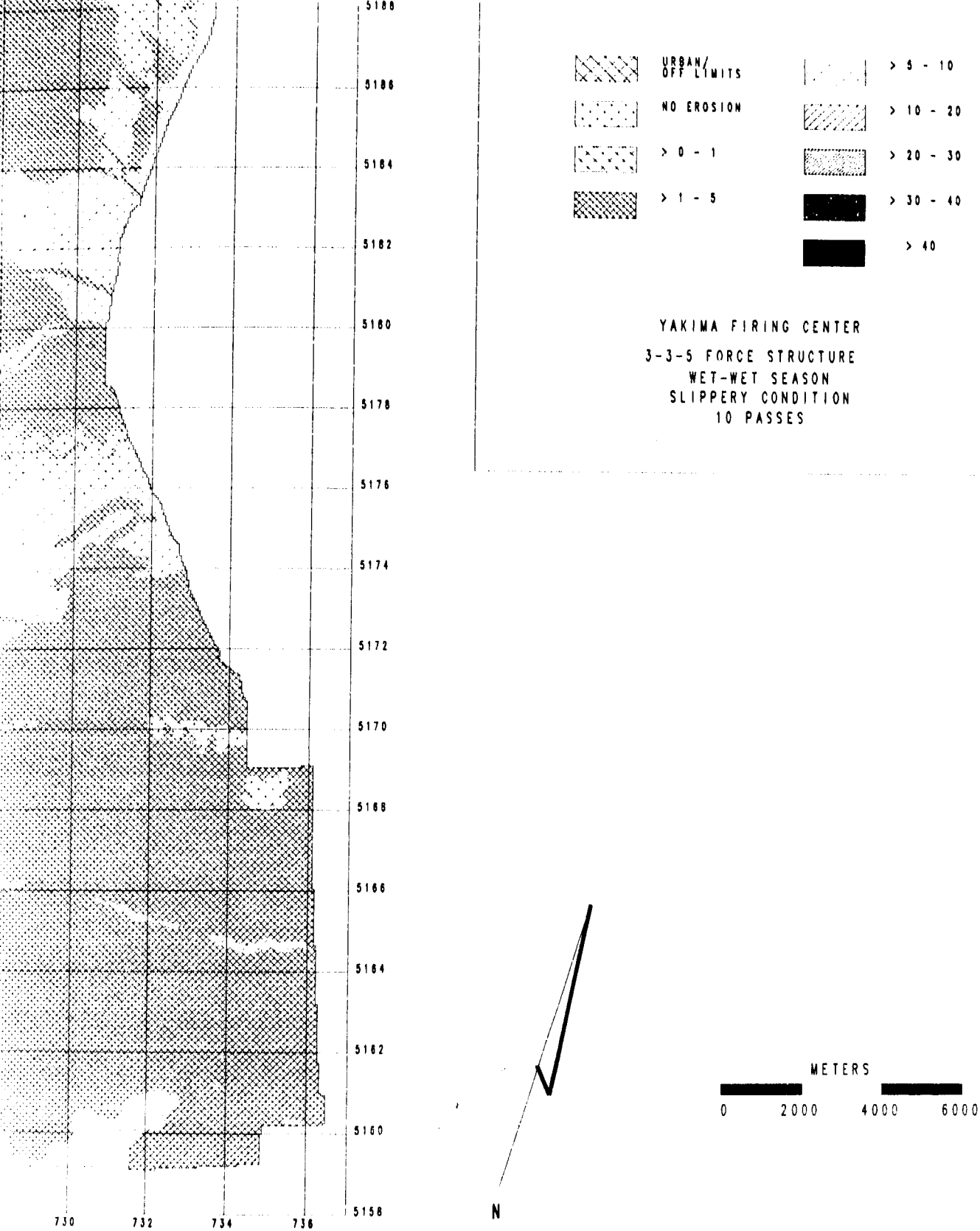


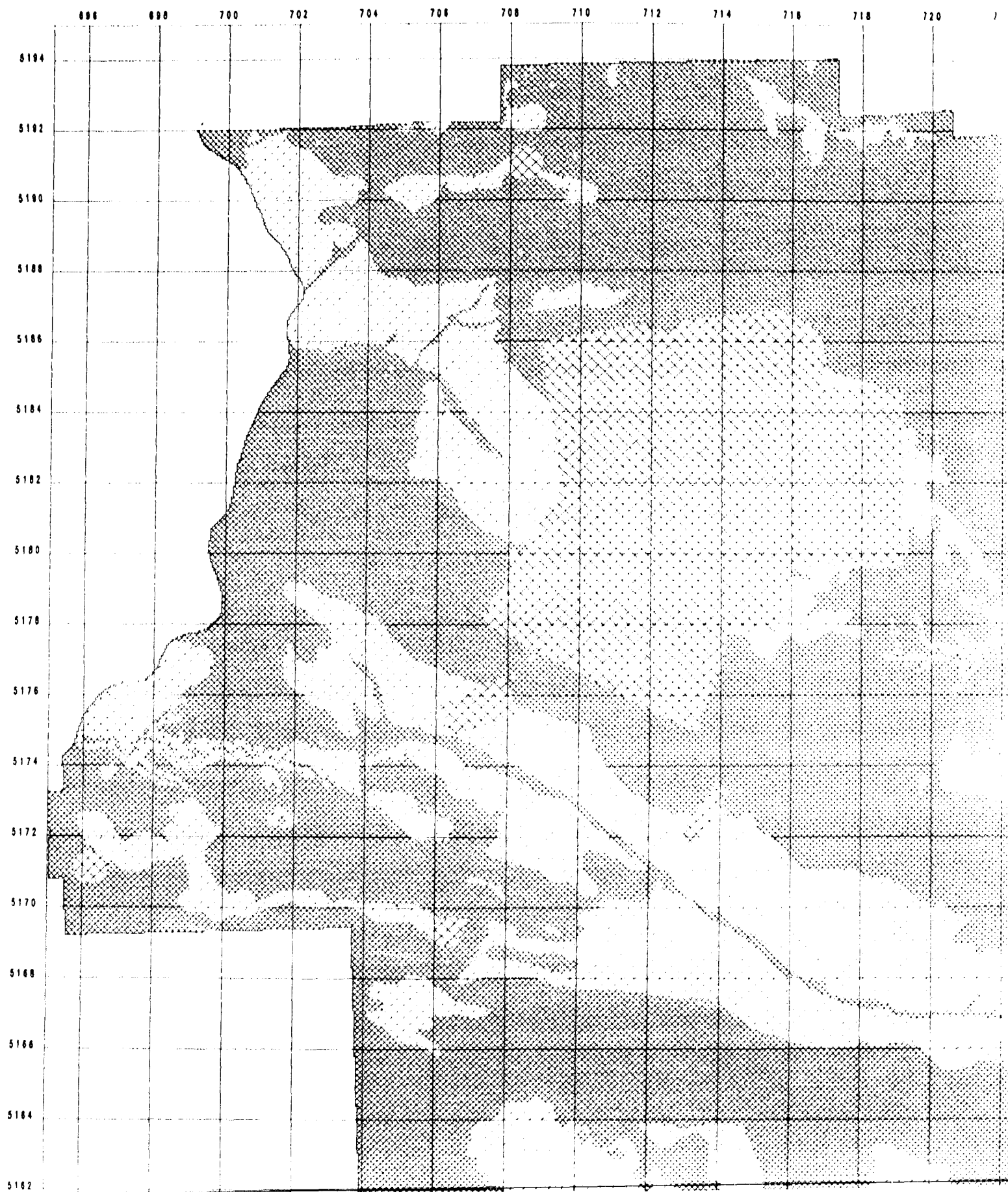
Plate 36. Rate of soil erosion for 3-3-5 and 4-3-3



ate 36. Rate of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface condition for ten pas

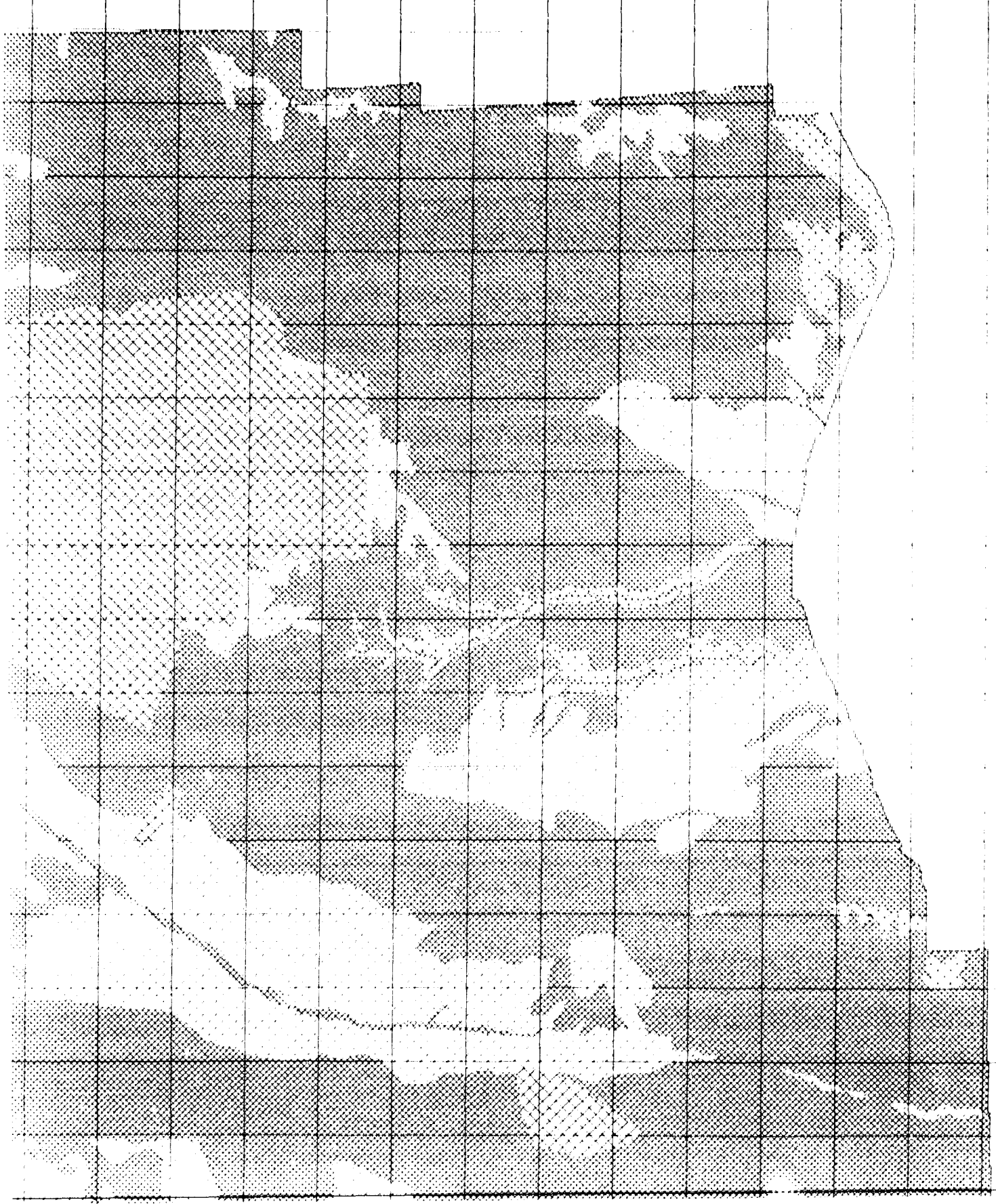


in the wet-wet slippery surface condition for ten passes

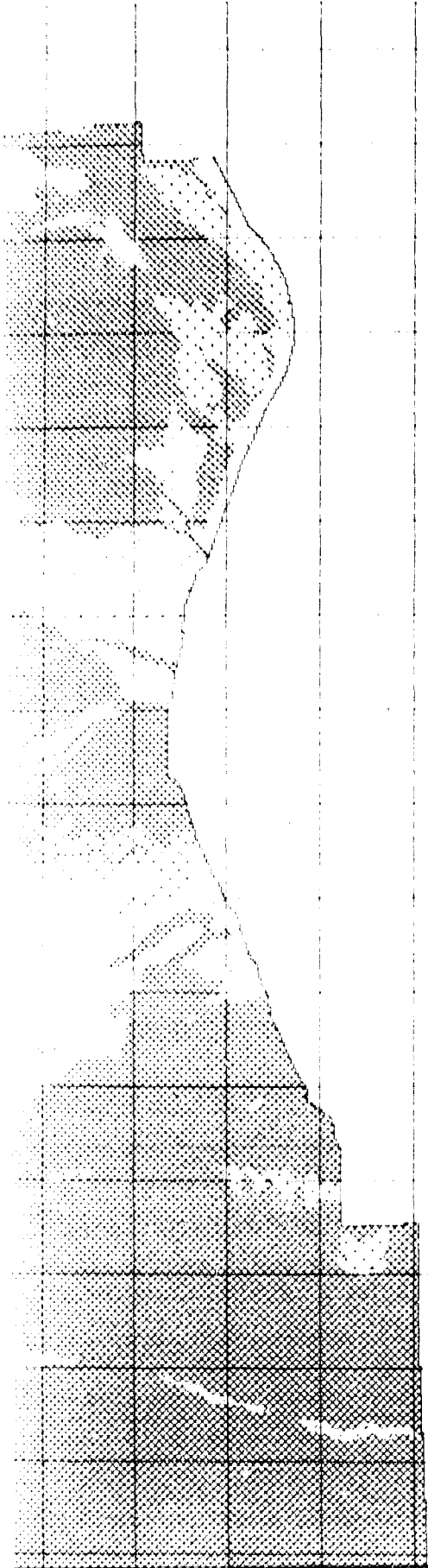


710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164



728 730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

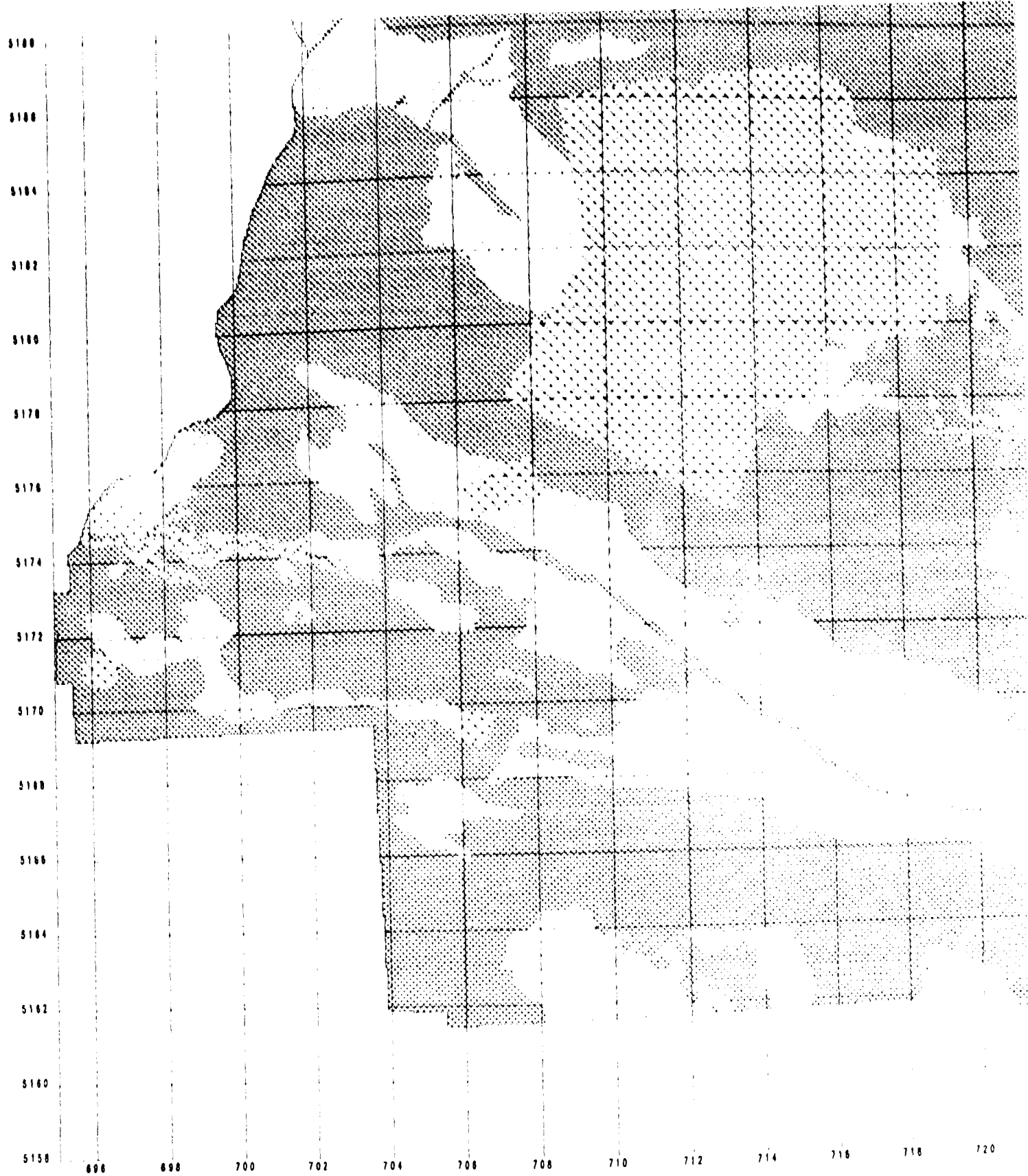
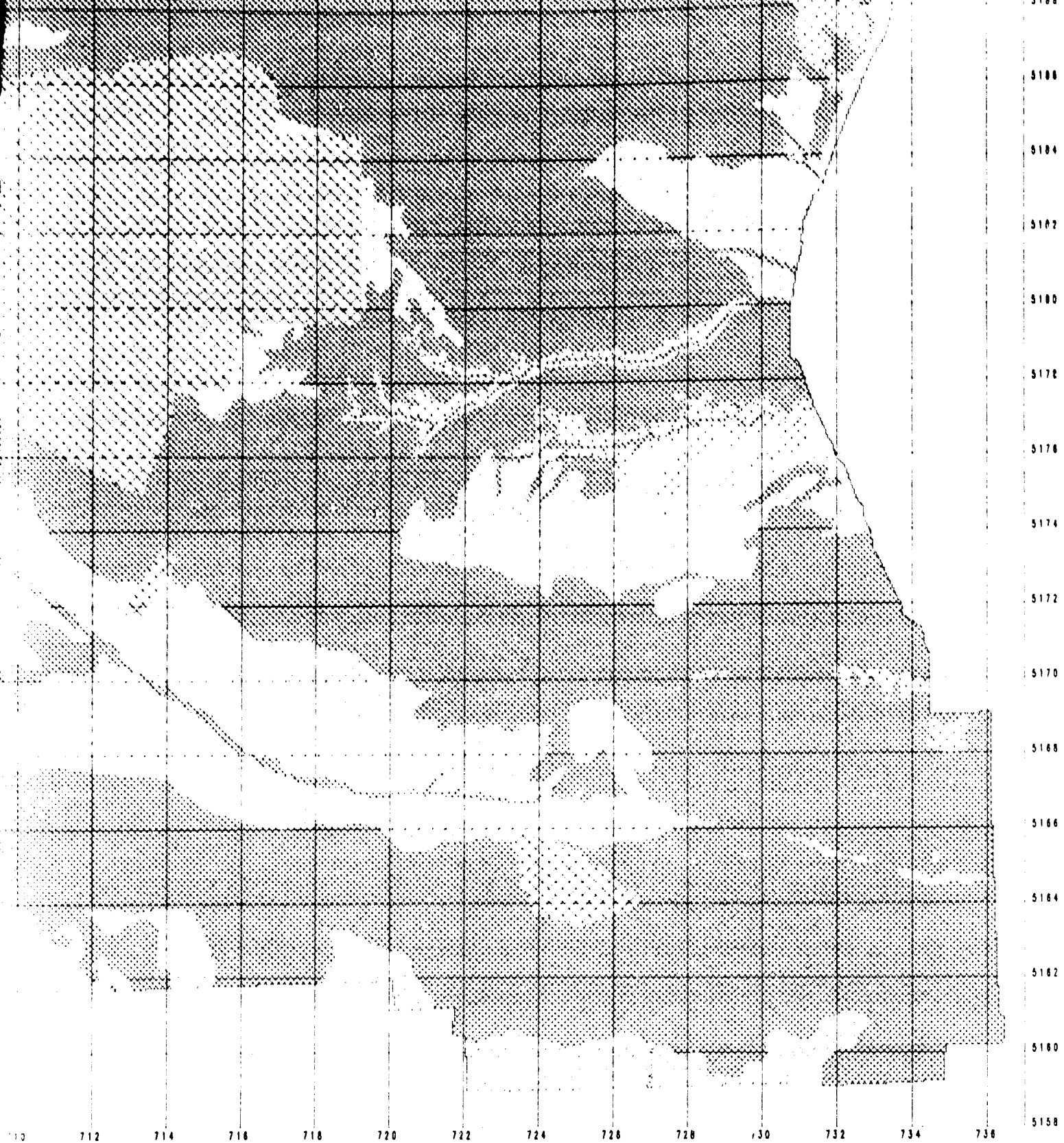
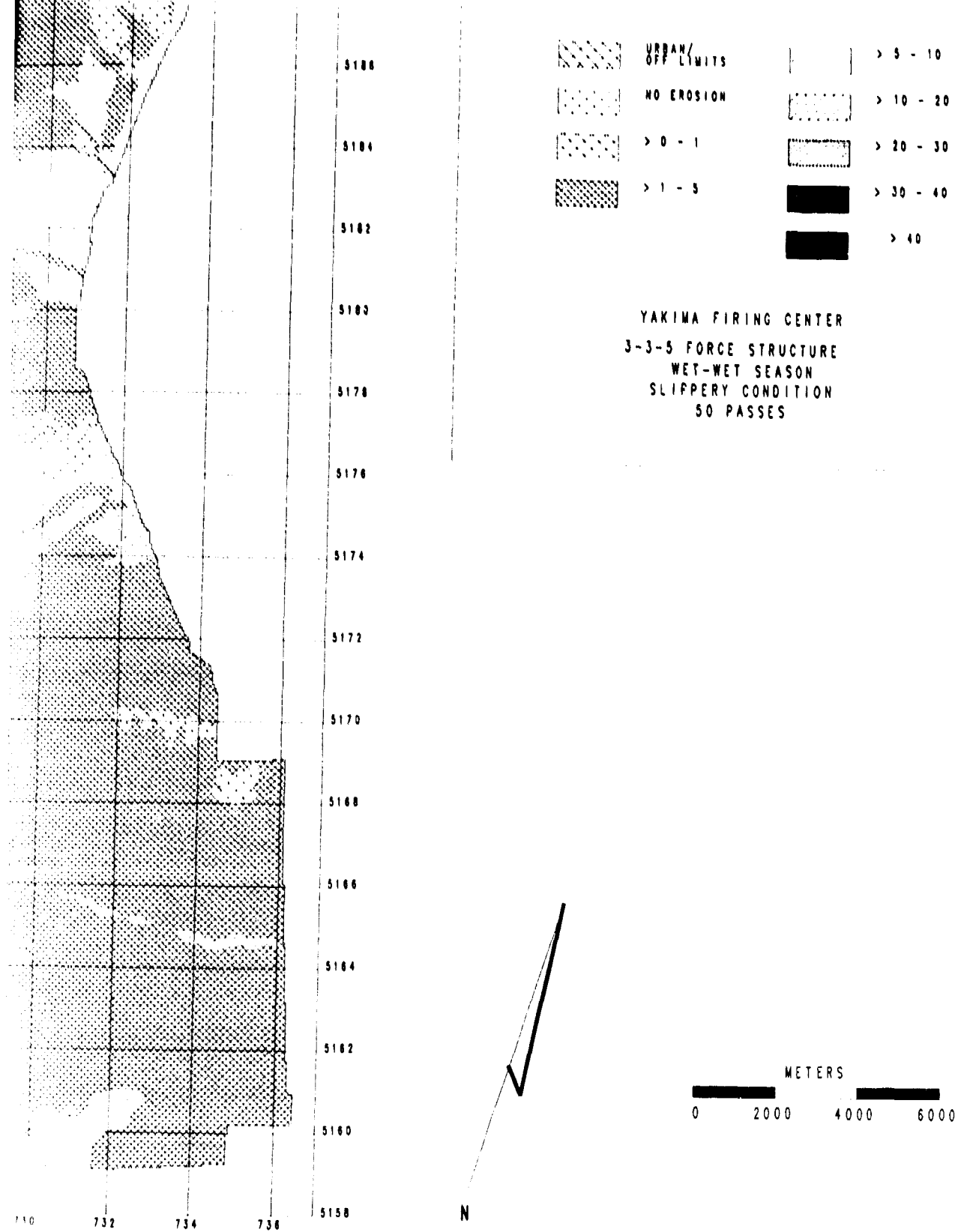


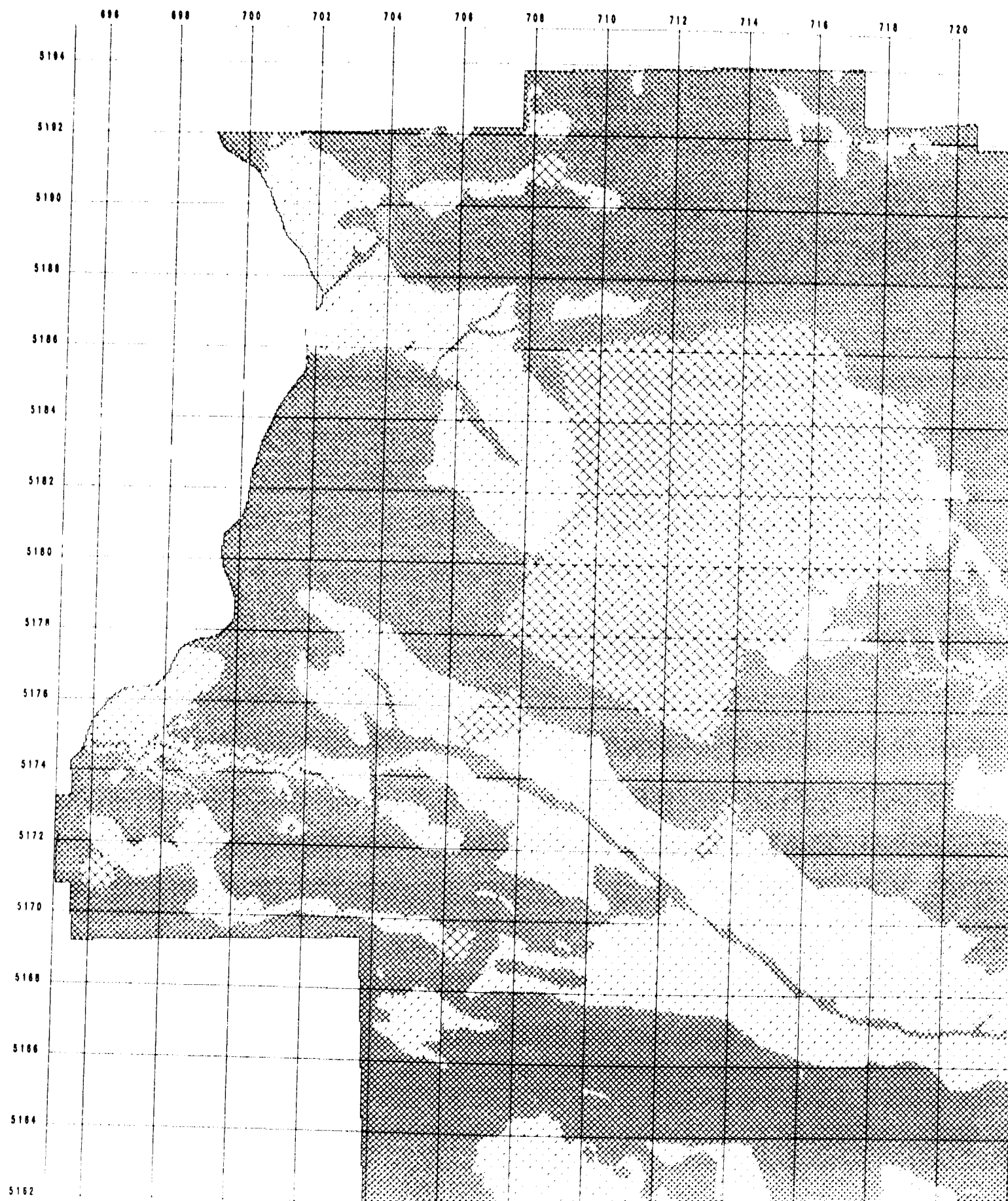
Plate 37. Rate of soil erosion for 3-3-5 and 4-3-3



37. Rate of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface condition for fifty pa



wet-wet slippery surface condition for fifty passes



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

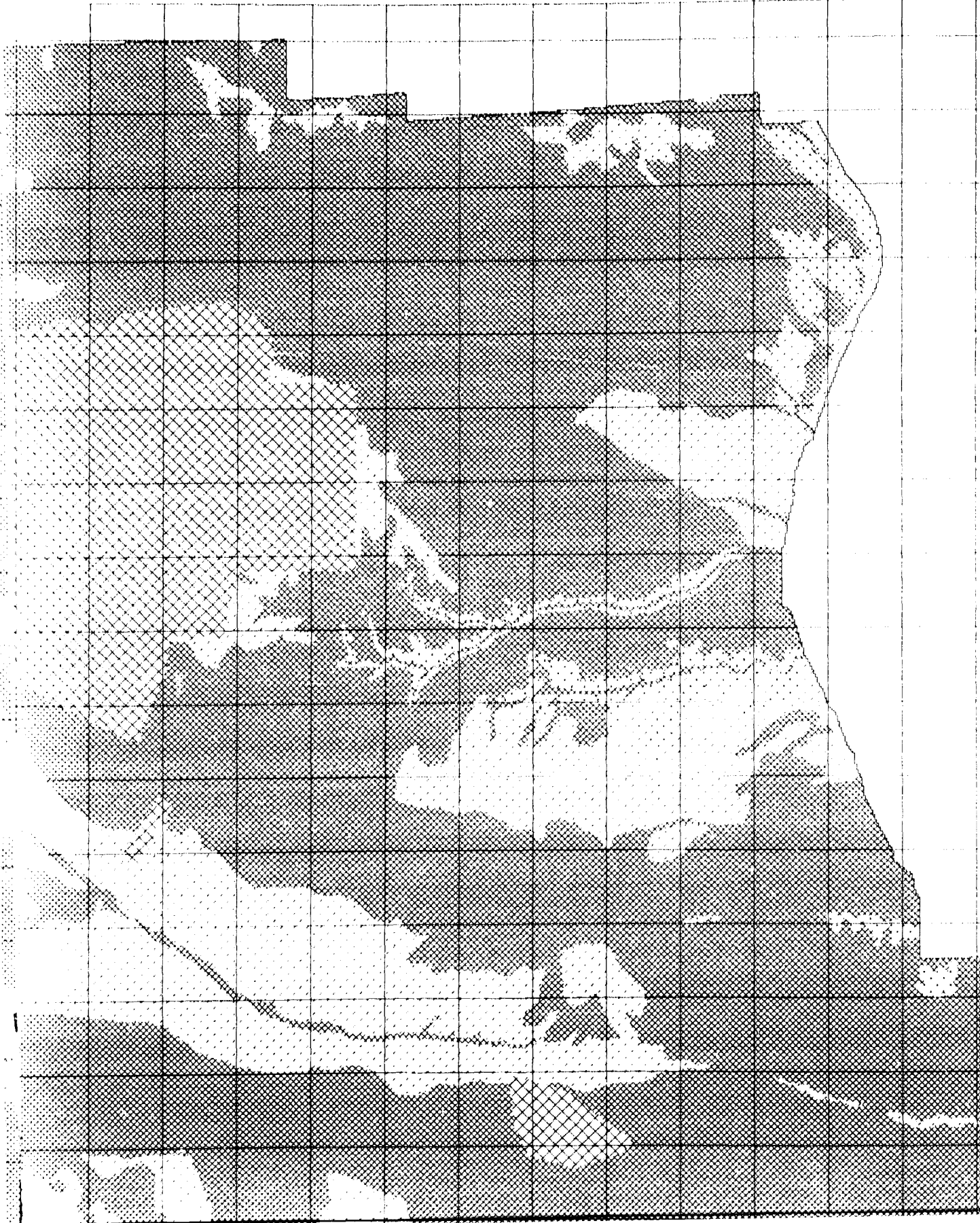
5172

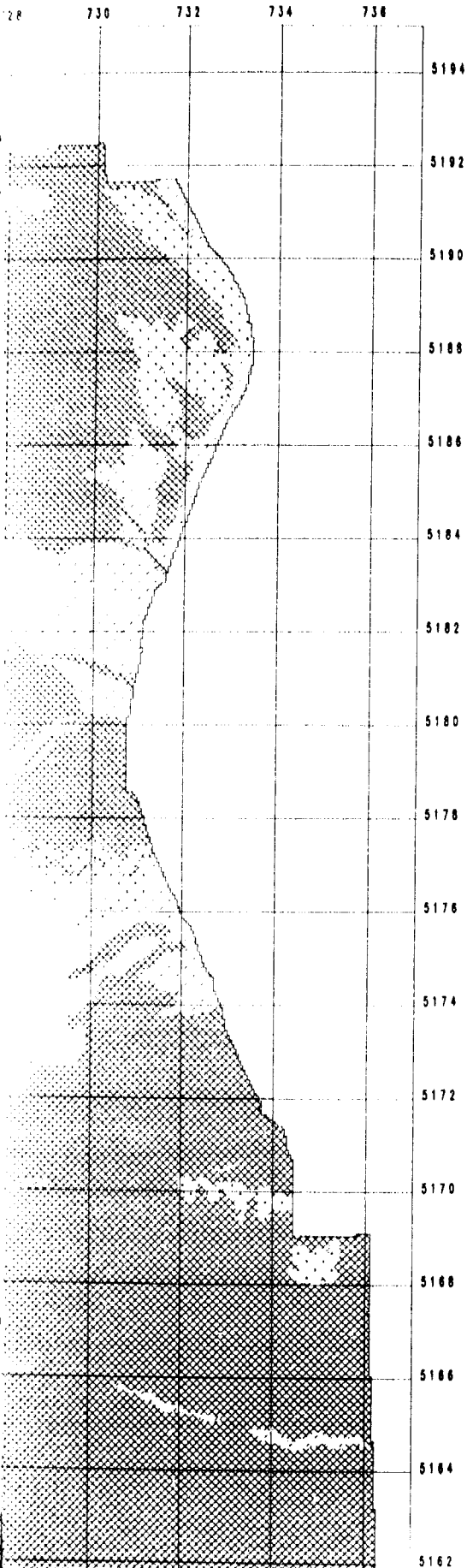
5170

5168

5166

5164





U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

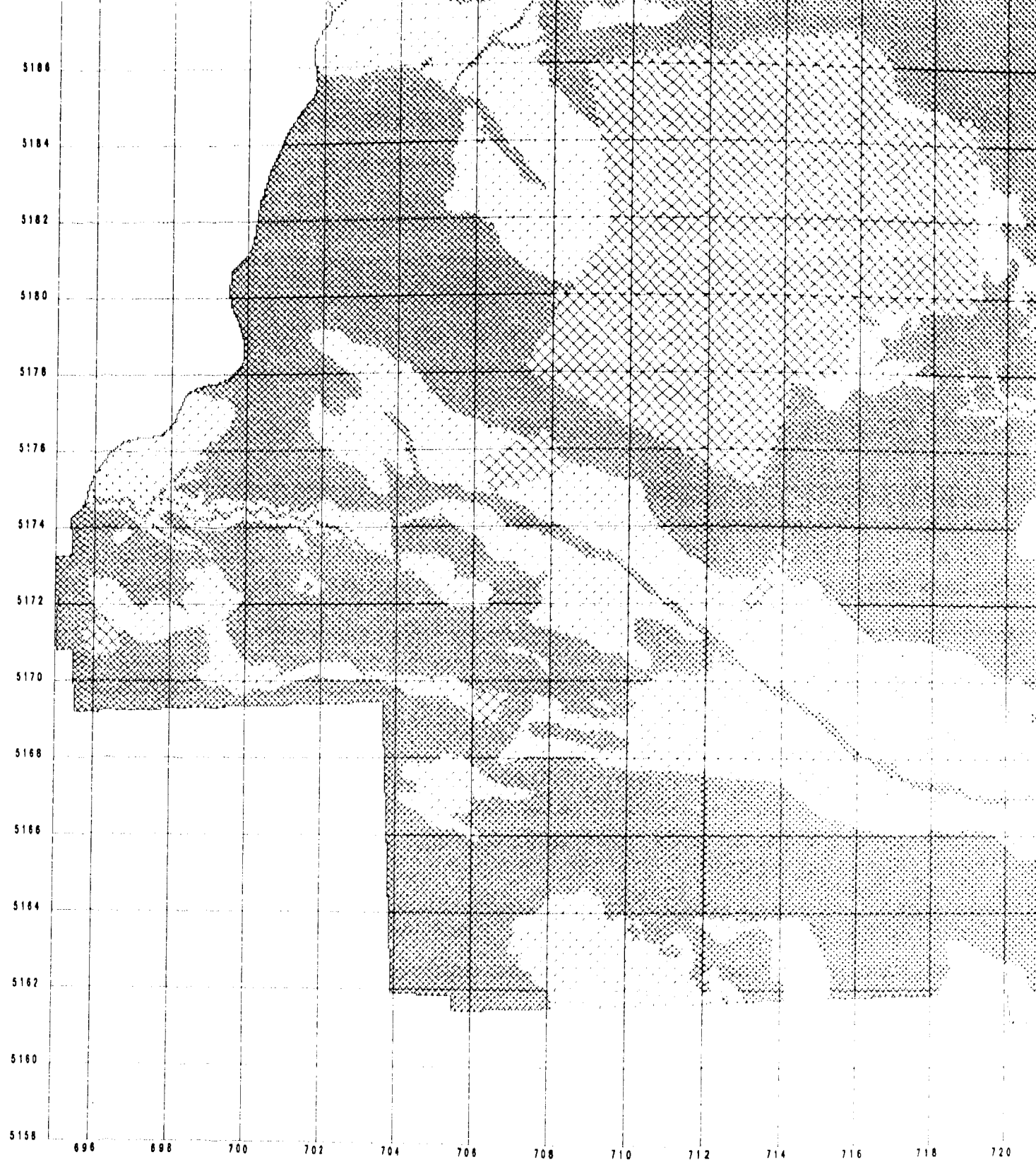
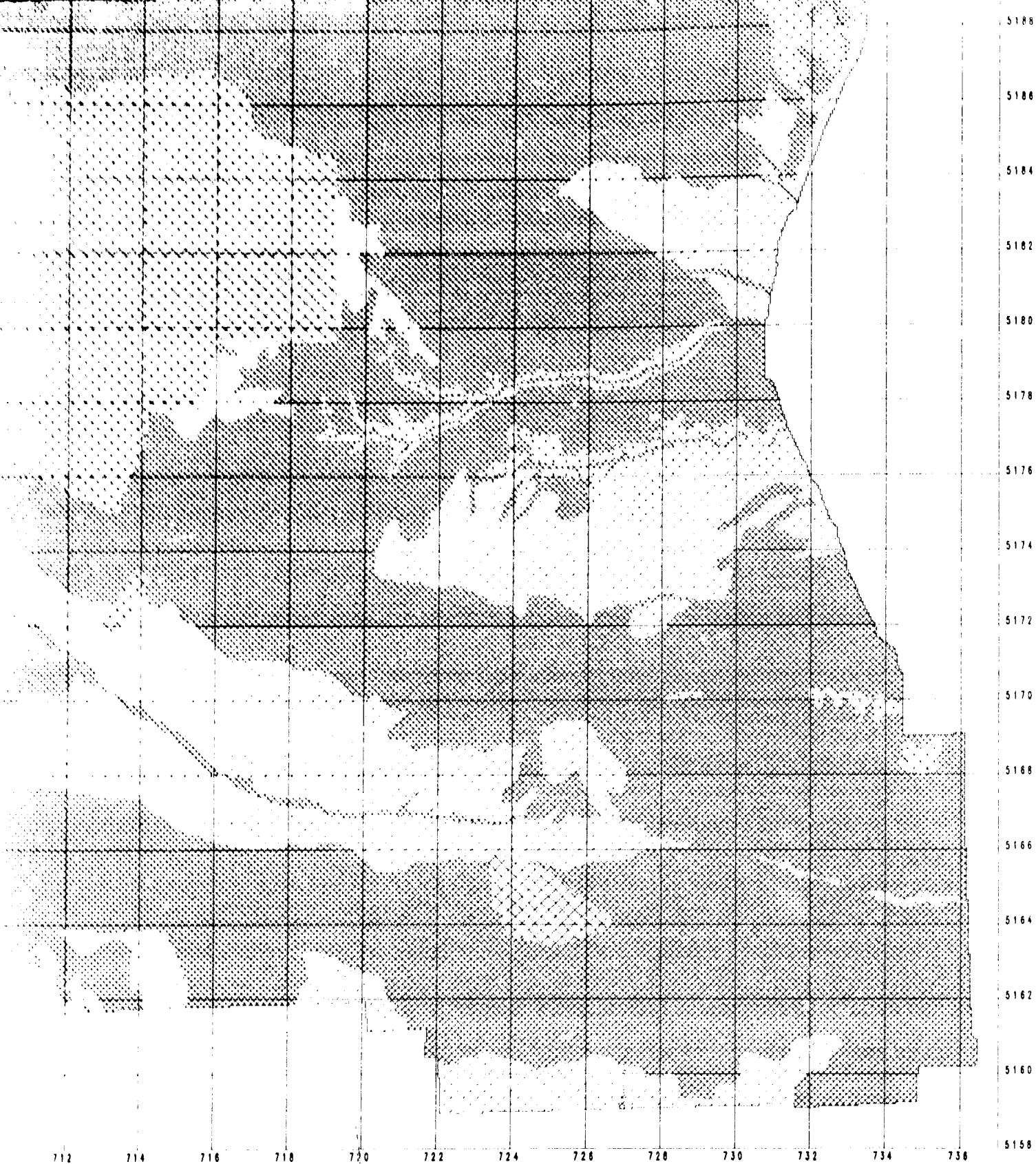
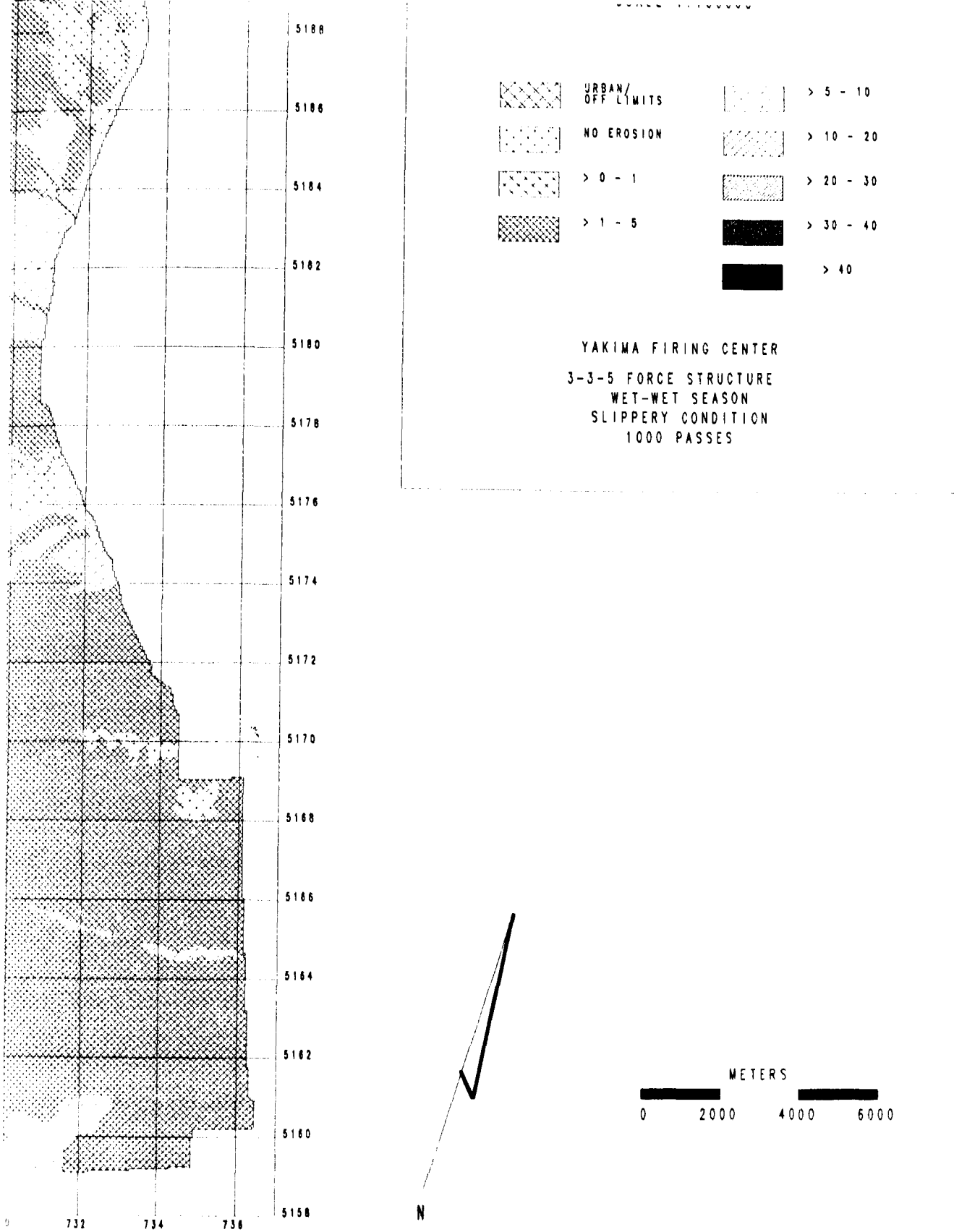


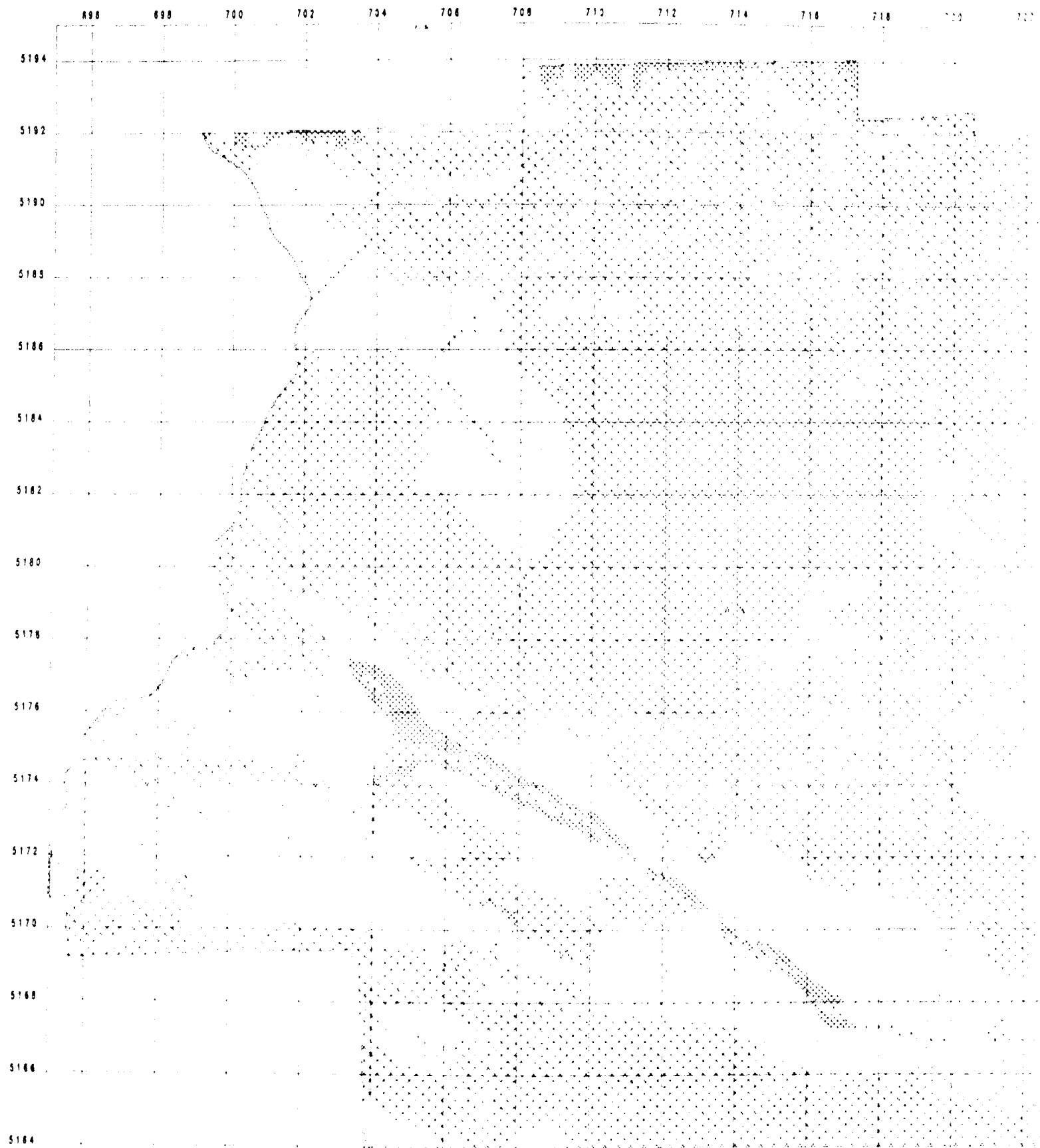
Plate 38. Rate of soil erosion for 3-3-5 and 4-3-3 (HMM)

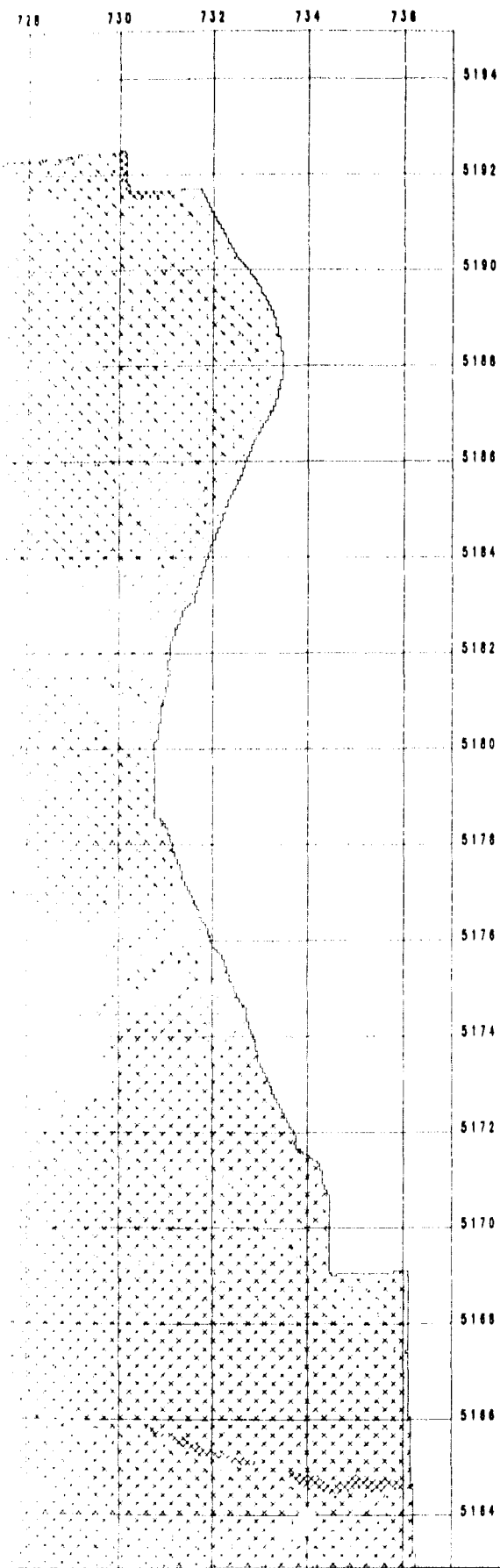


of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet-wet slippery surface condition for one thousand passes



slippery surface condition for one thousand passes





U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

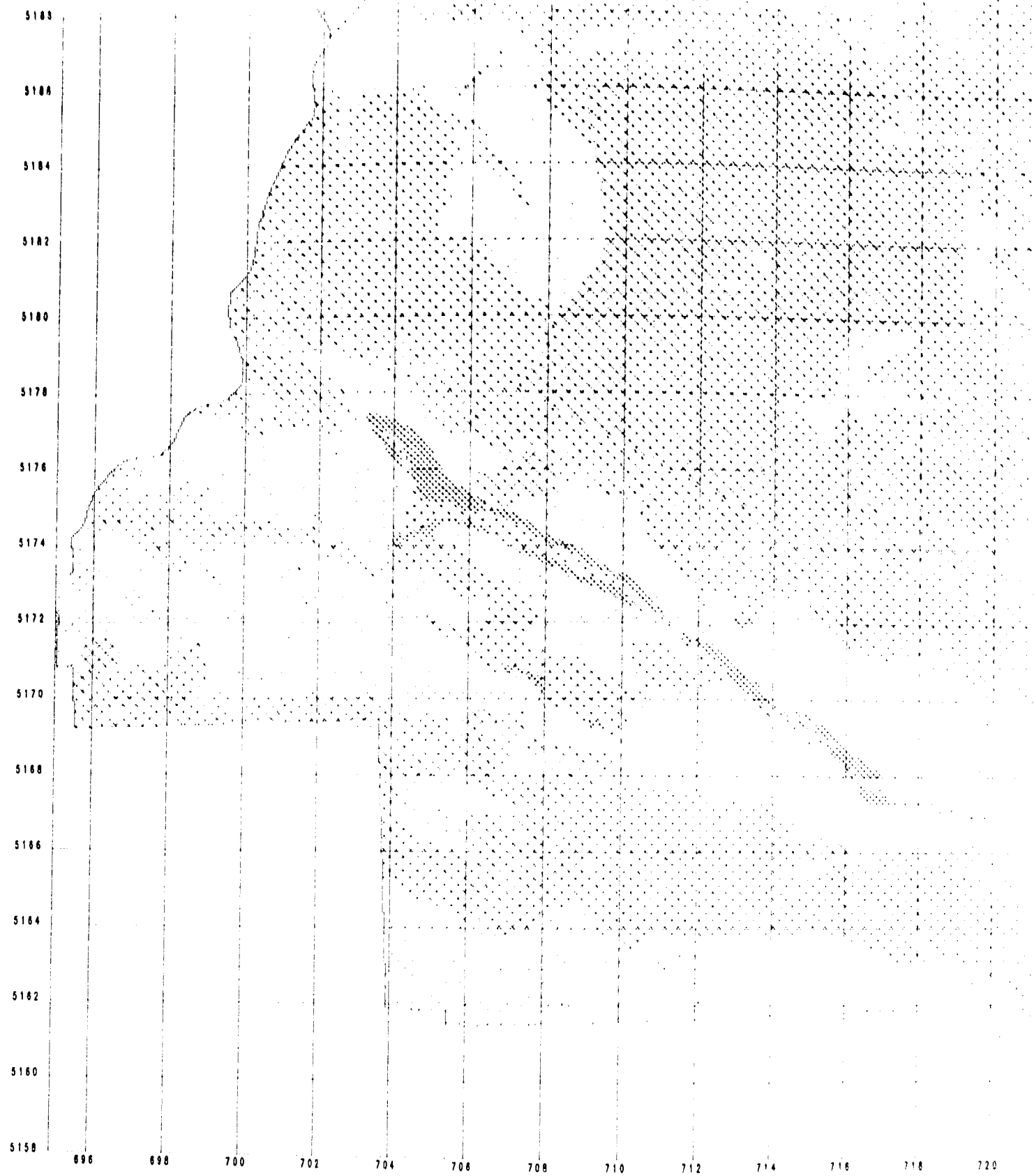


Plate 39. Rate of soil erosion for the 4-3-4

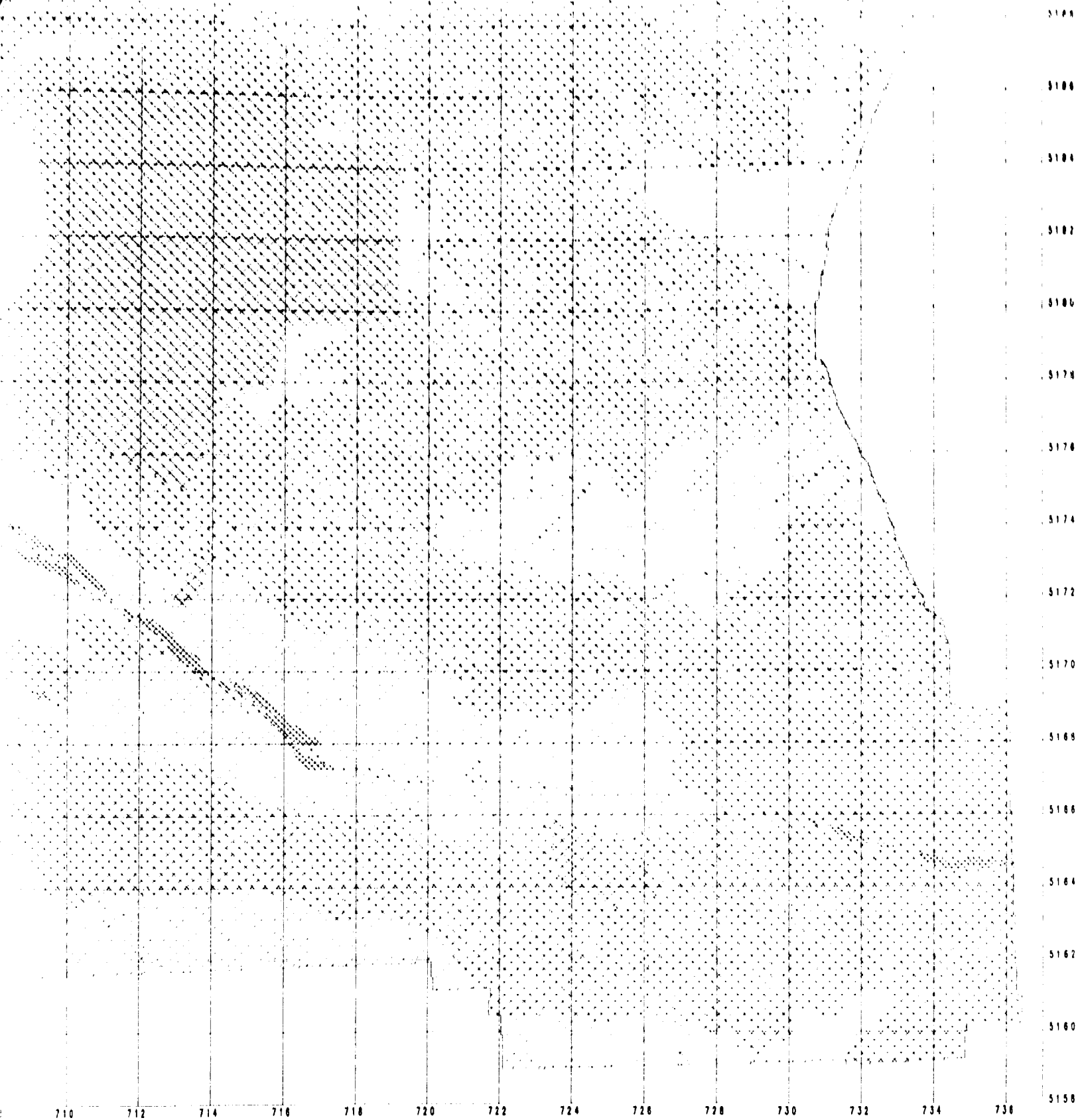
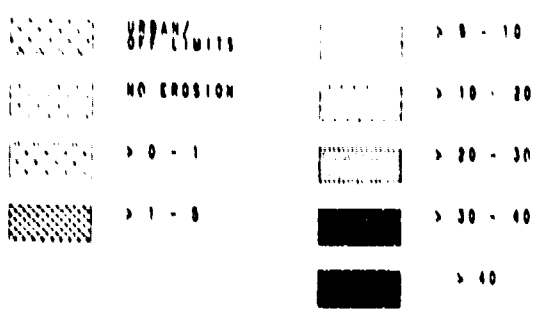
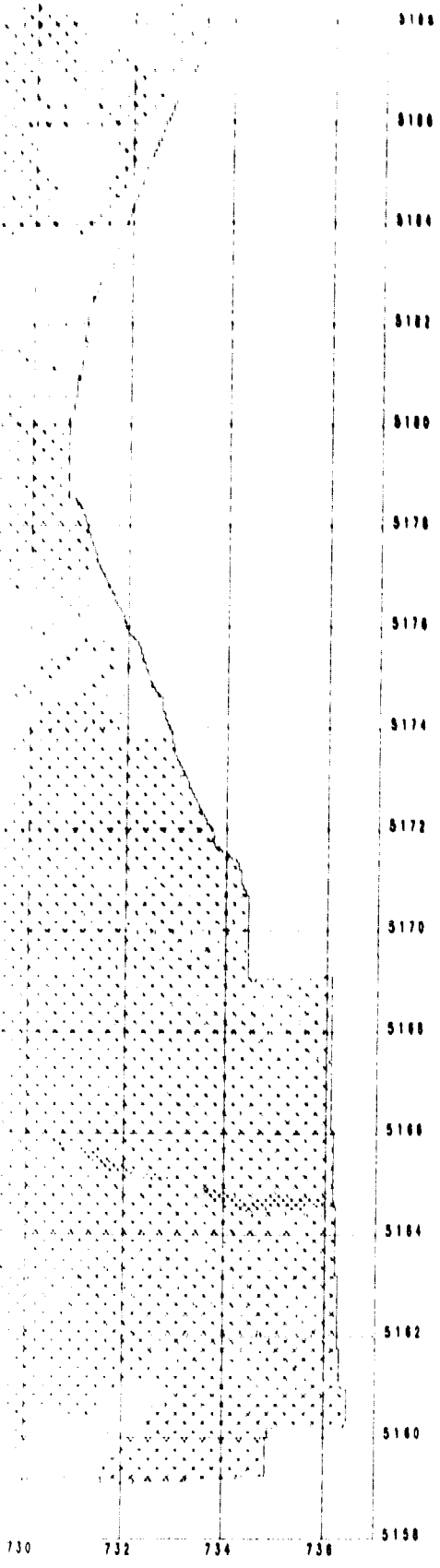
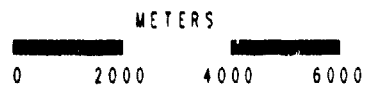
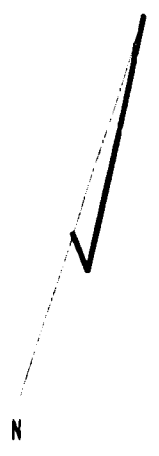


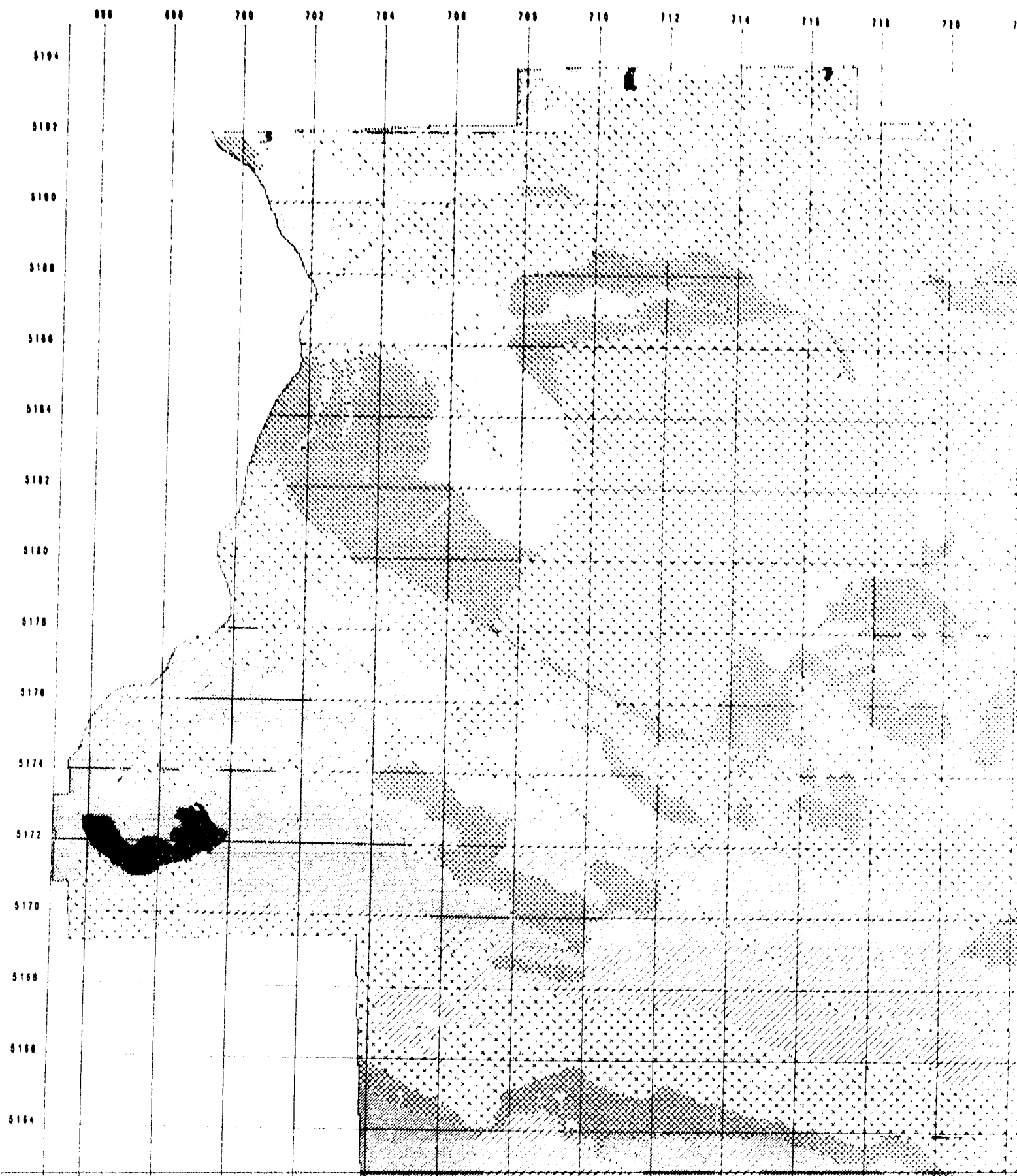
Plate 39. Rate of soil erosion for the 4-3-3 (8x8) force structure in the dry normal surface condition for ten passes



YAKIMA FIRING CENTER
 4-3-3 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 10 PASSES



dry normal surface condition for ten passes



712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

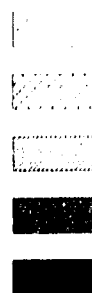


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS
NO EROSION
> 0 - 1
> 1 - 5



> 5 - 10
> 10 - 20
> 20 - 30
> 30 - 40
> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

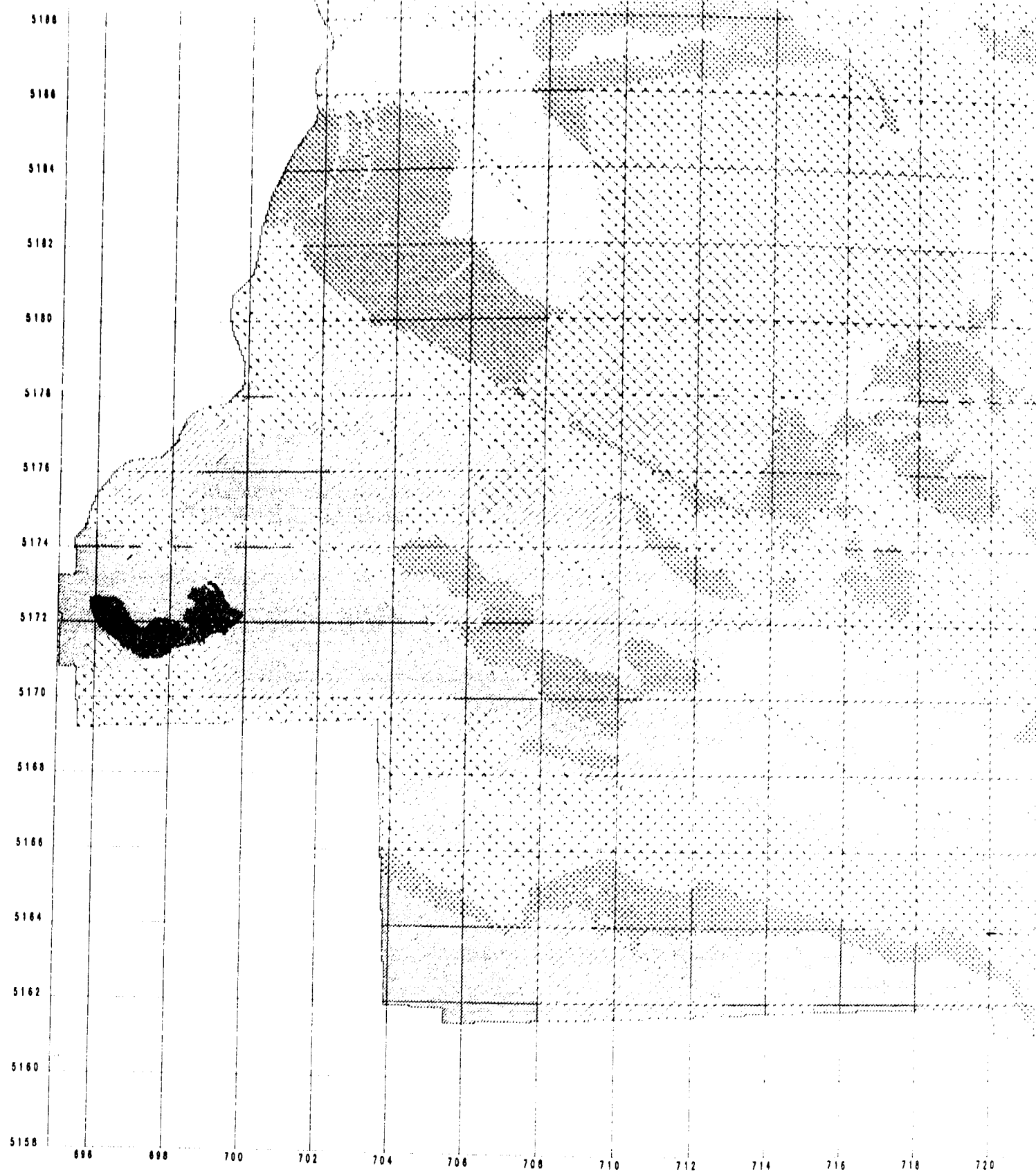


Plate 40. Rate of soil erosion for the 4-3-3

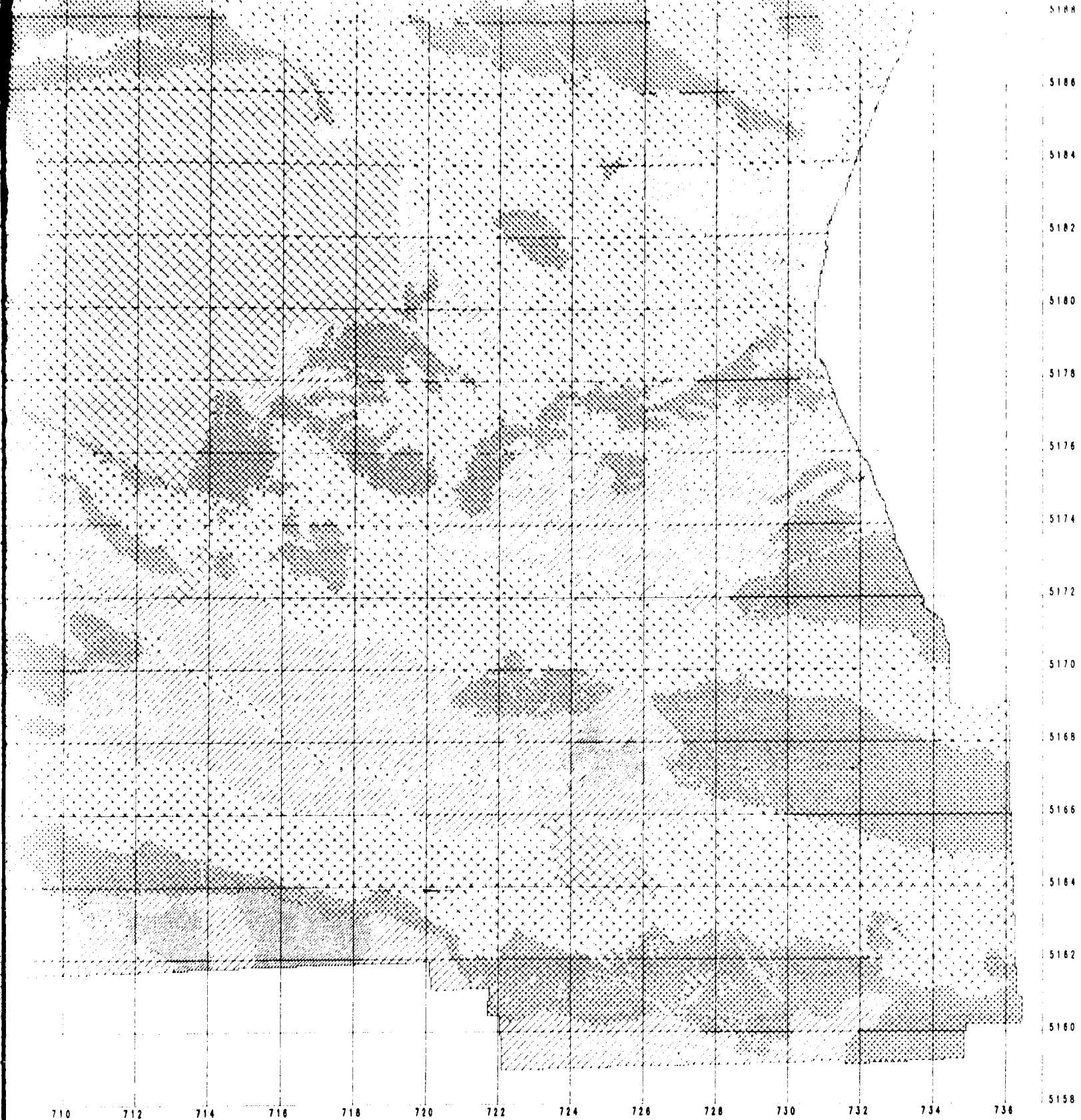
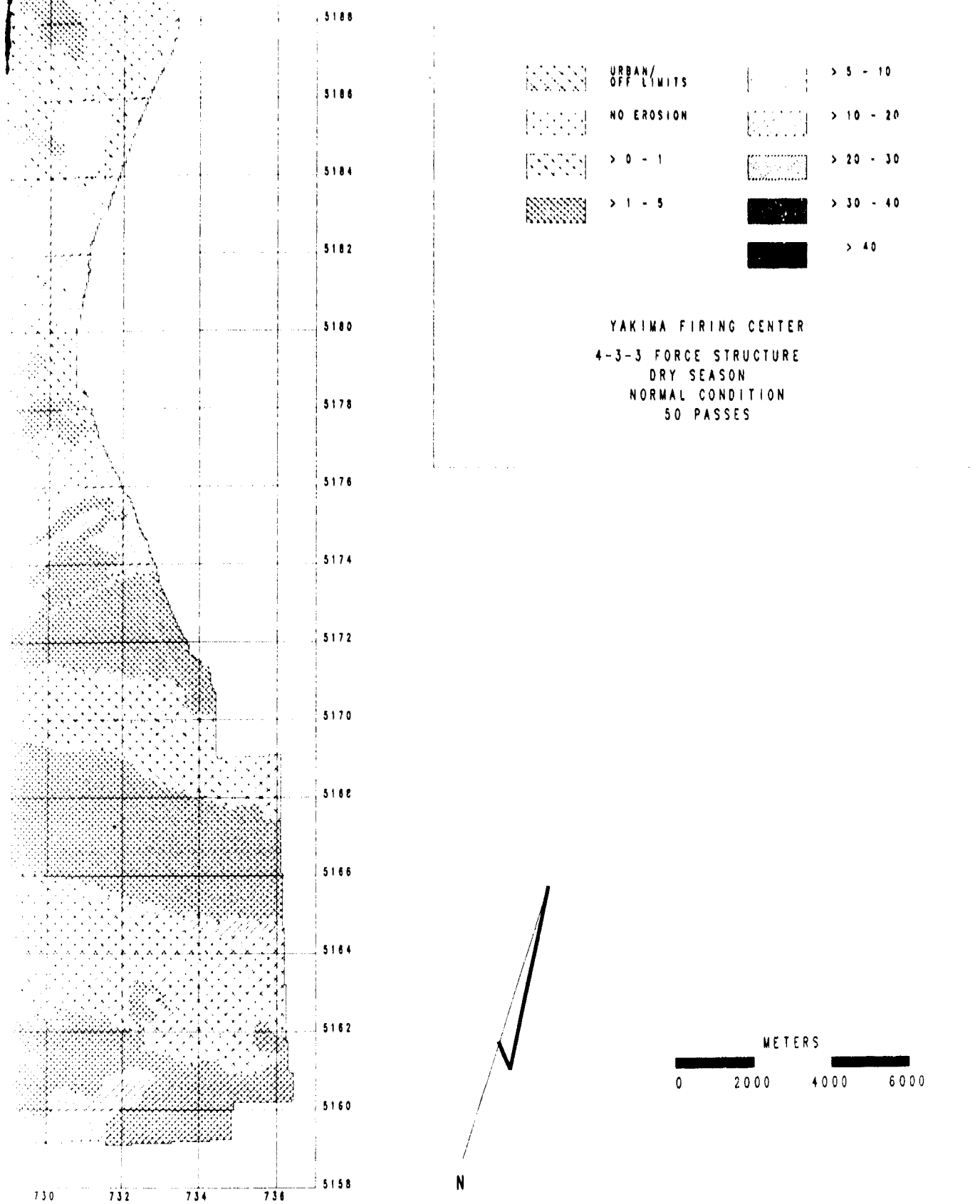
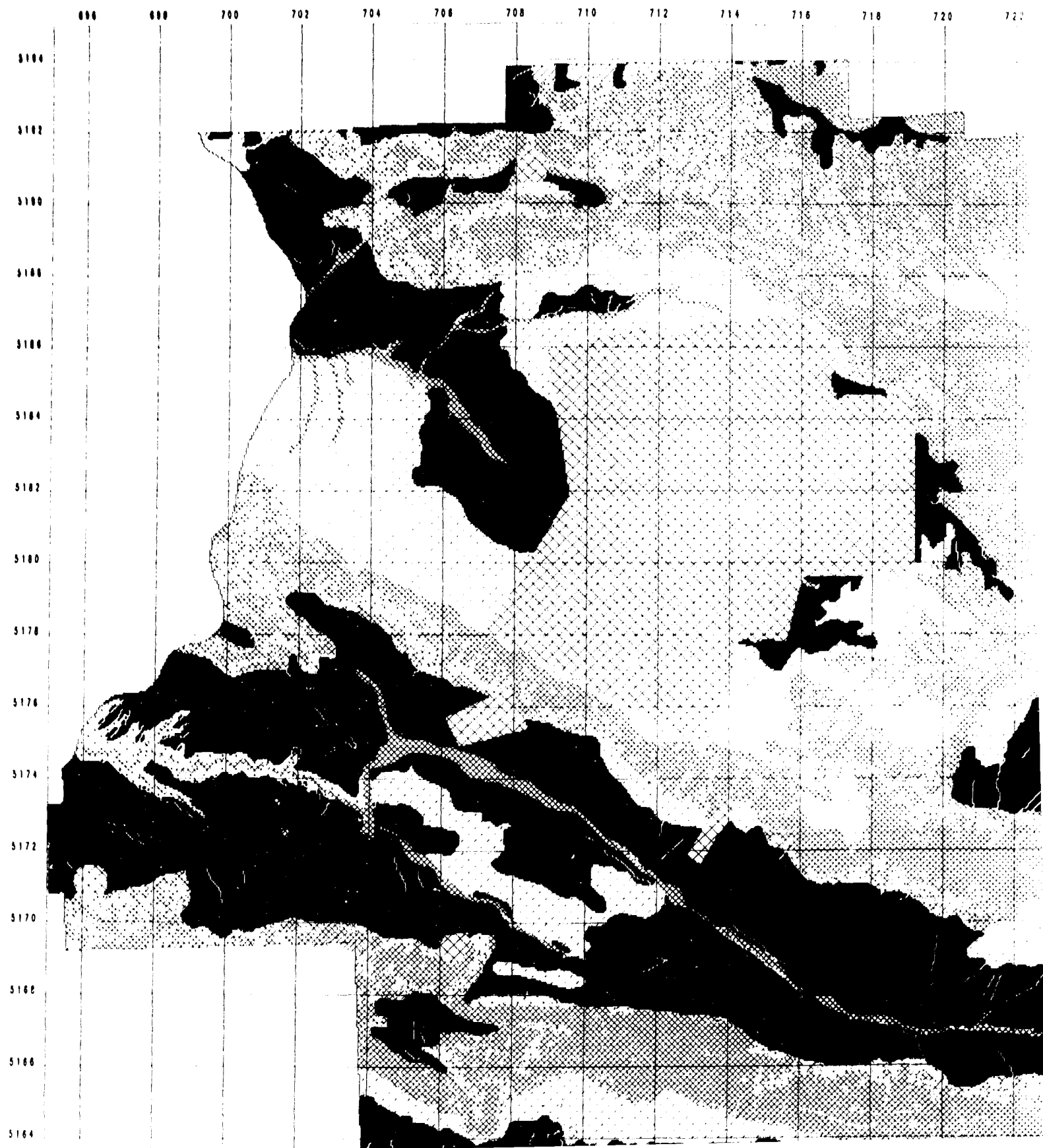


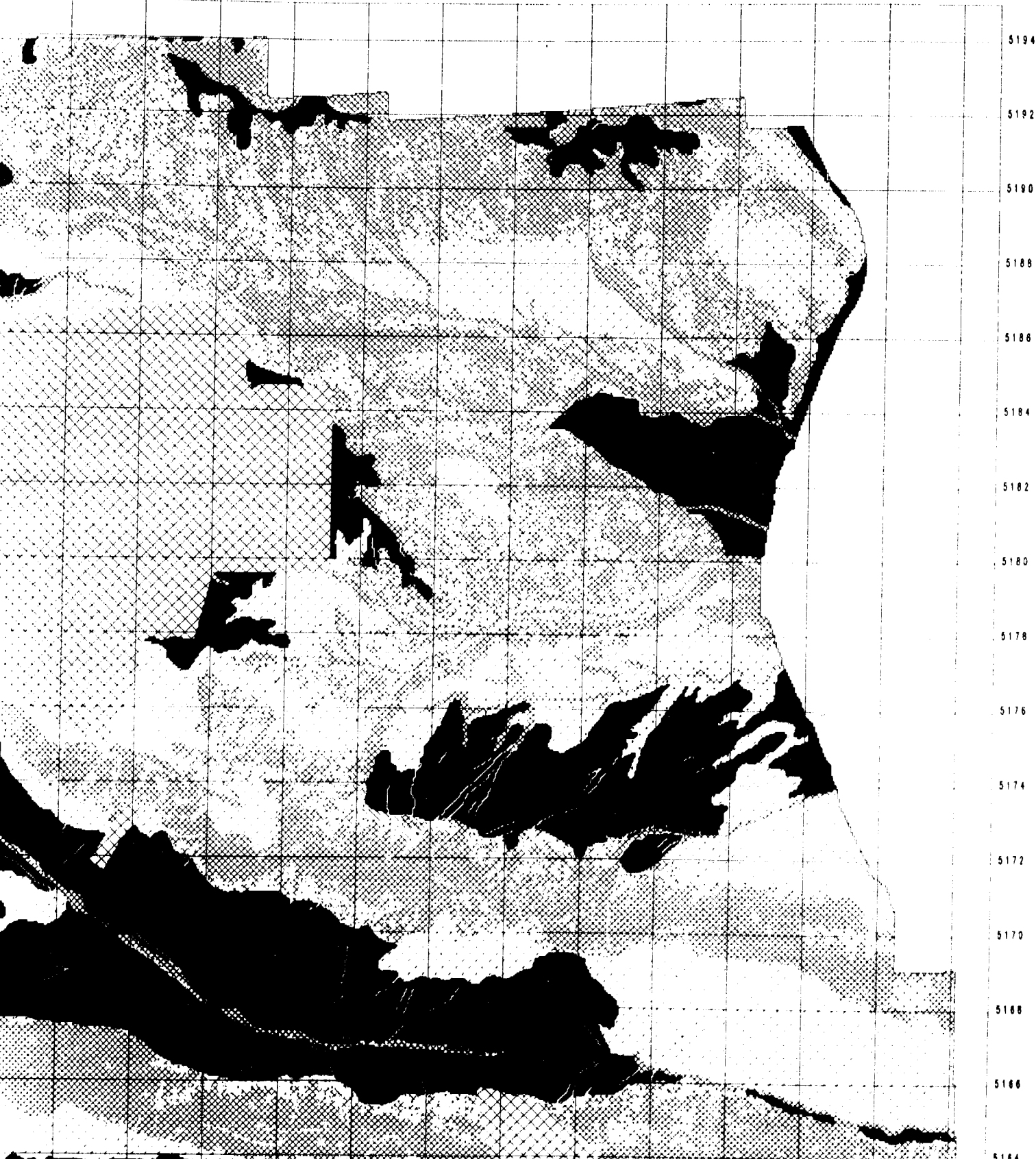
Plate 40. Rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition for fifty passes



ry normal surface condition for fifty passes



0 712 714 716 718 720 722 724 726 728 730 732 734 736

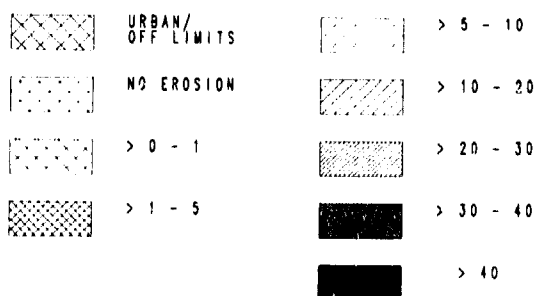




U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000



YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

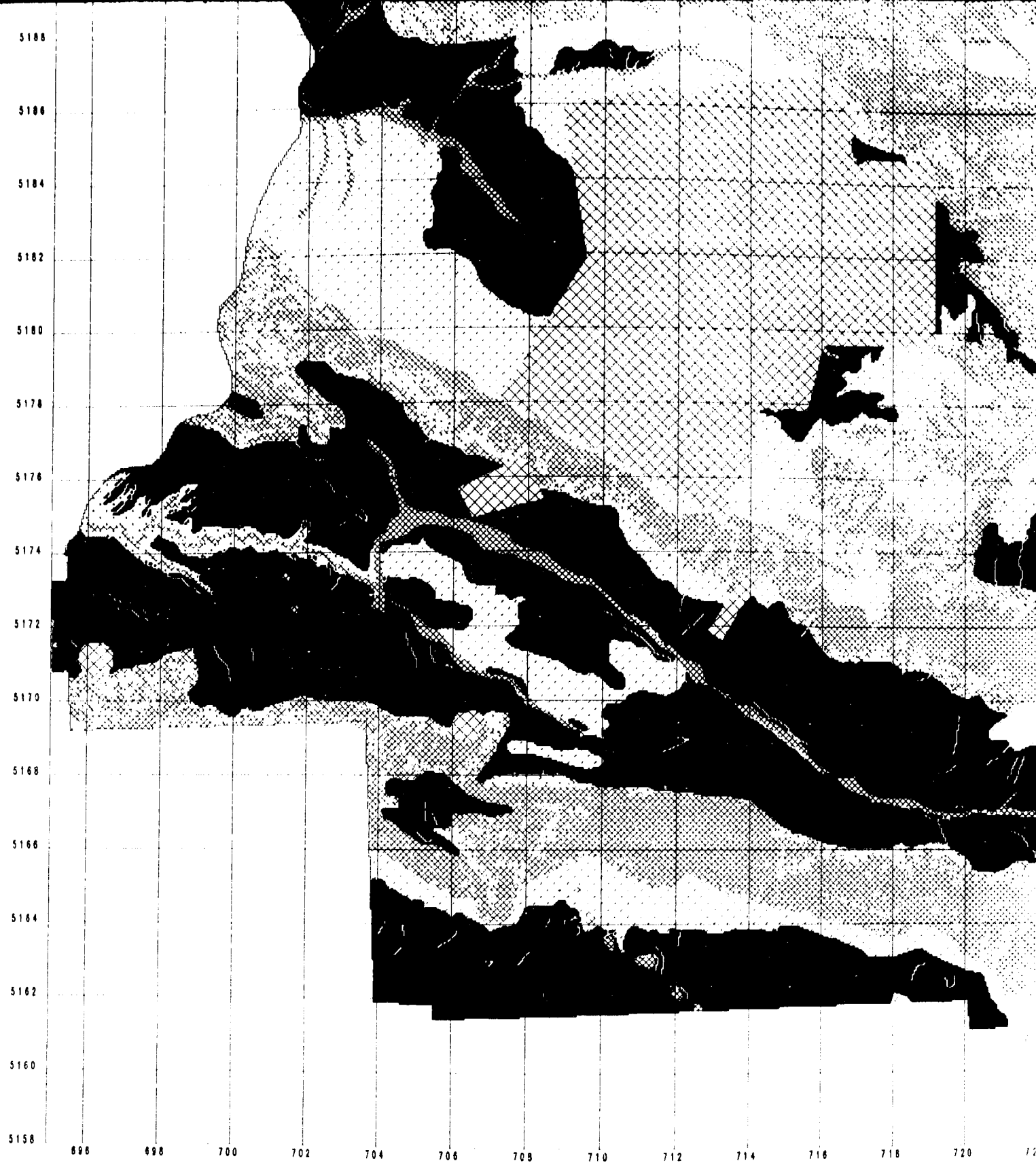


Plate 41. Rate of soil erosion for the 4-3-3 (8X)

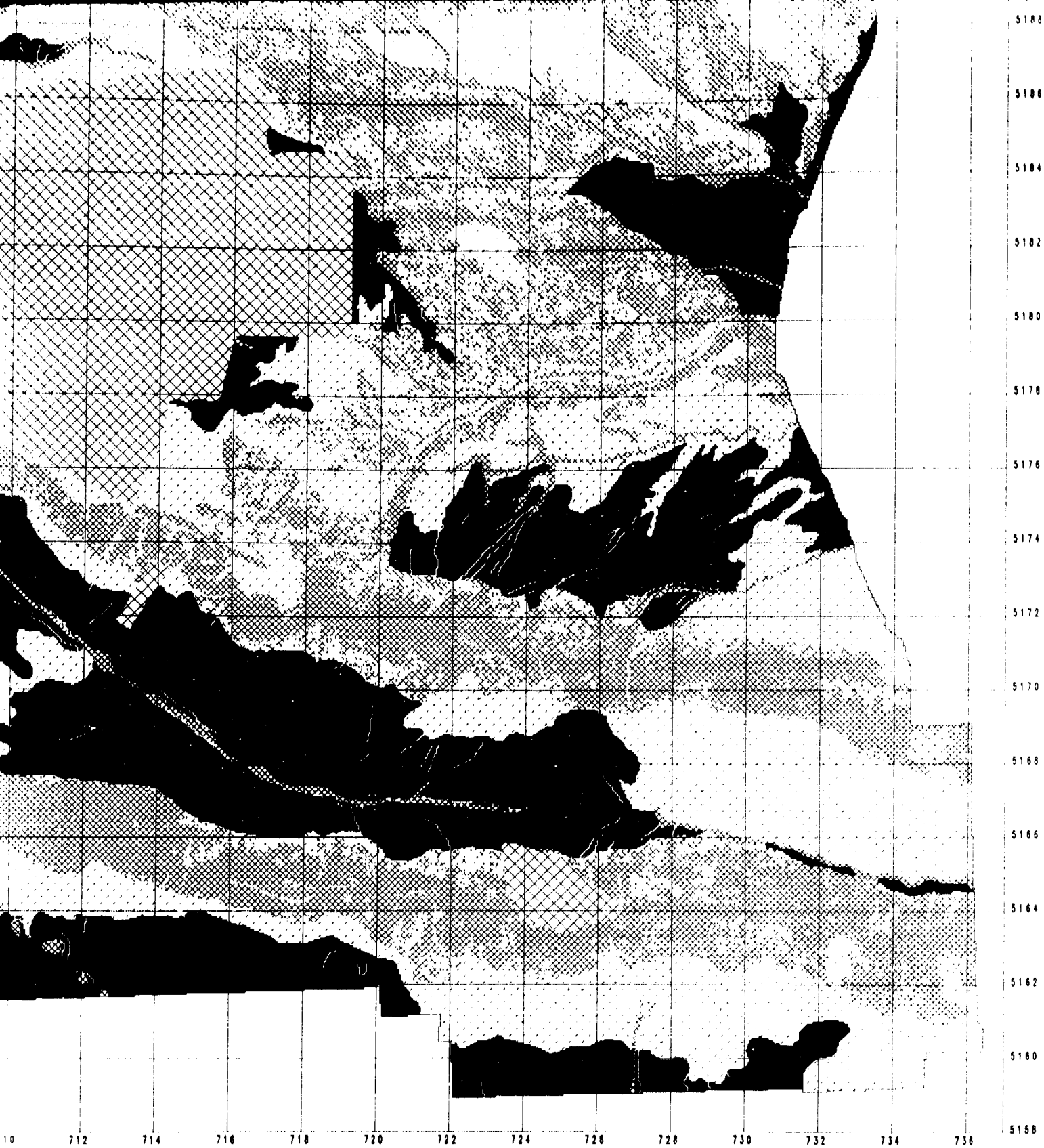
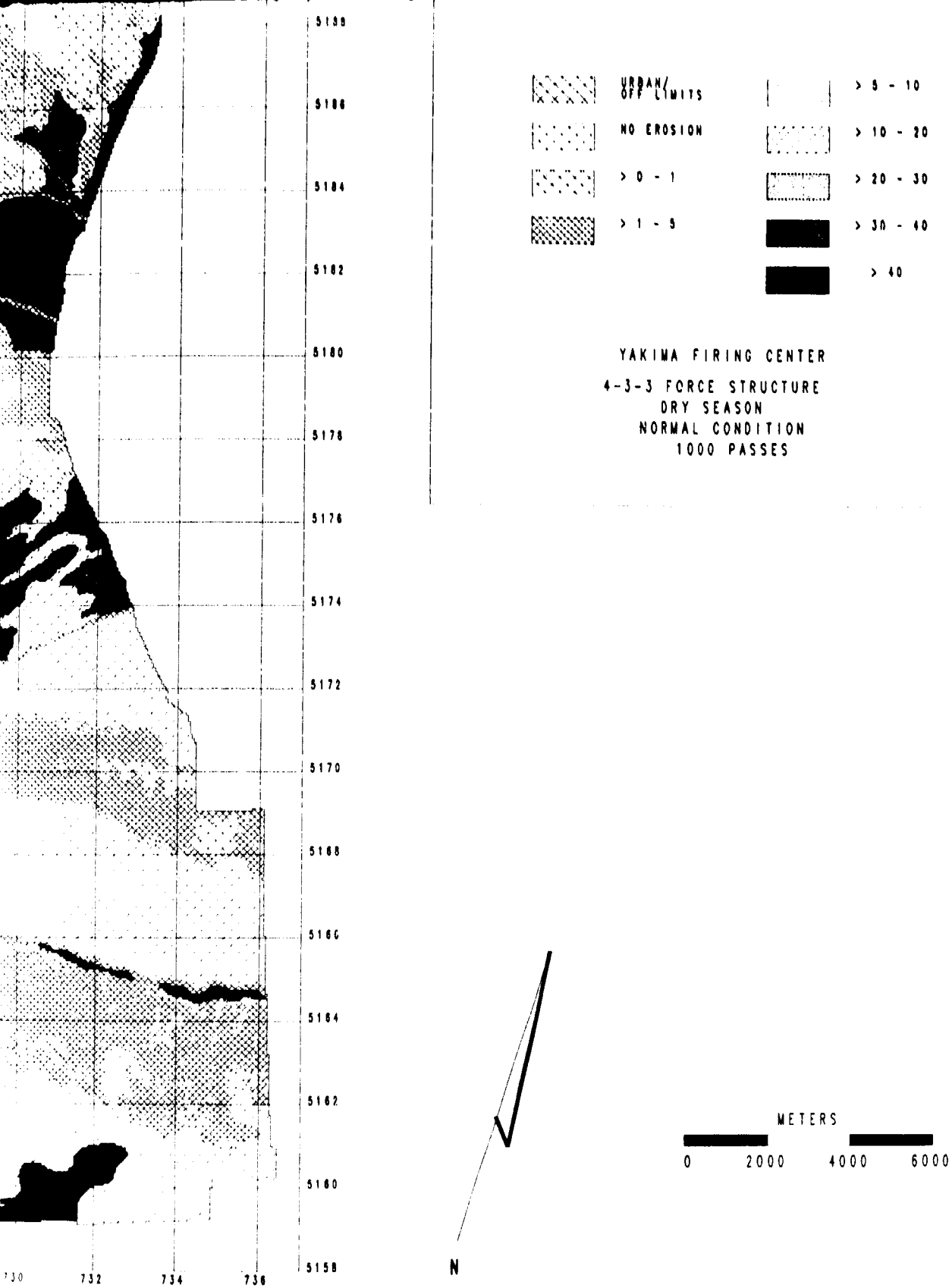
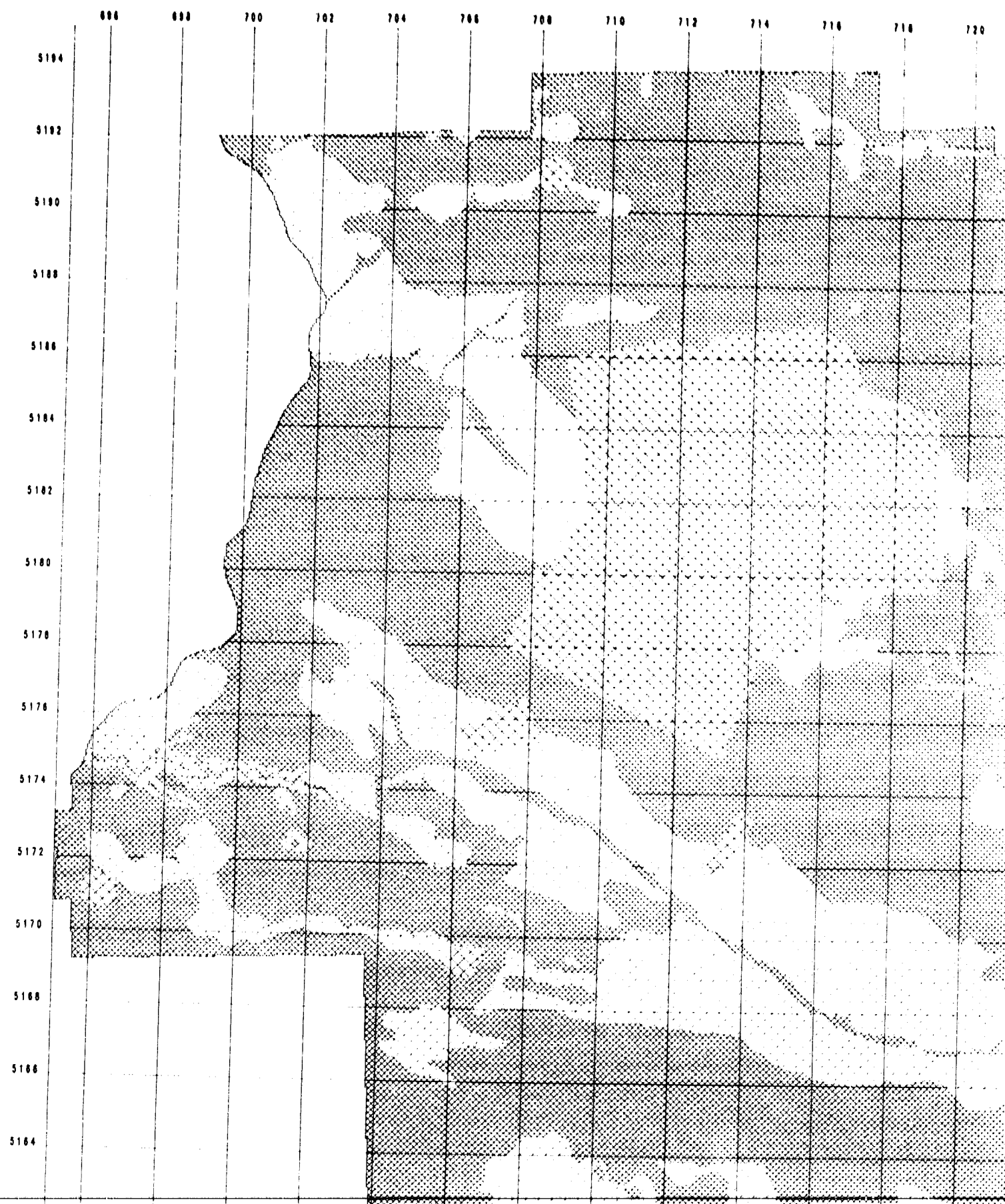


Plate 41. Rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition for one thousand passes



normal surface condition for one thousand passes



712 714 716 718 720 722 724 726 728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

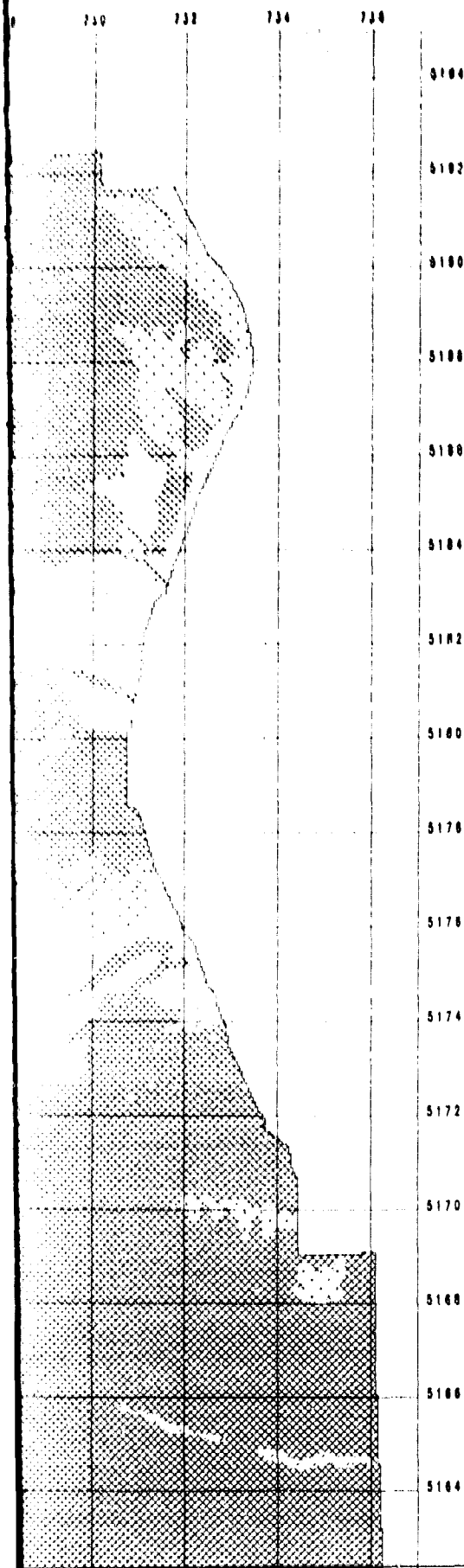
5170

5168

5166

5164





U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES

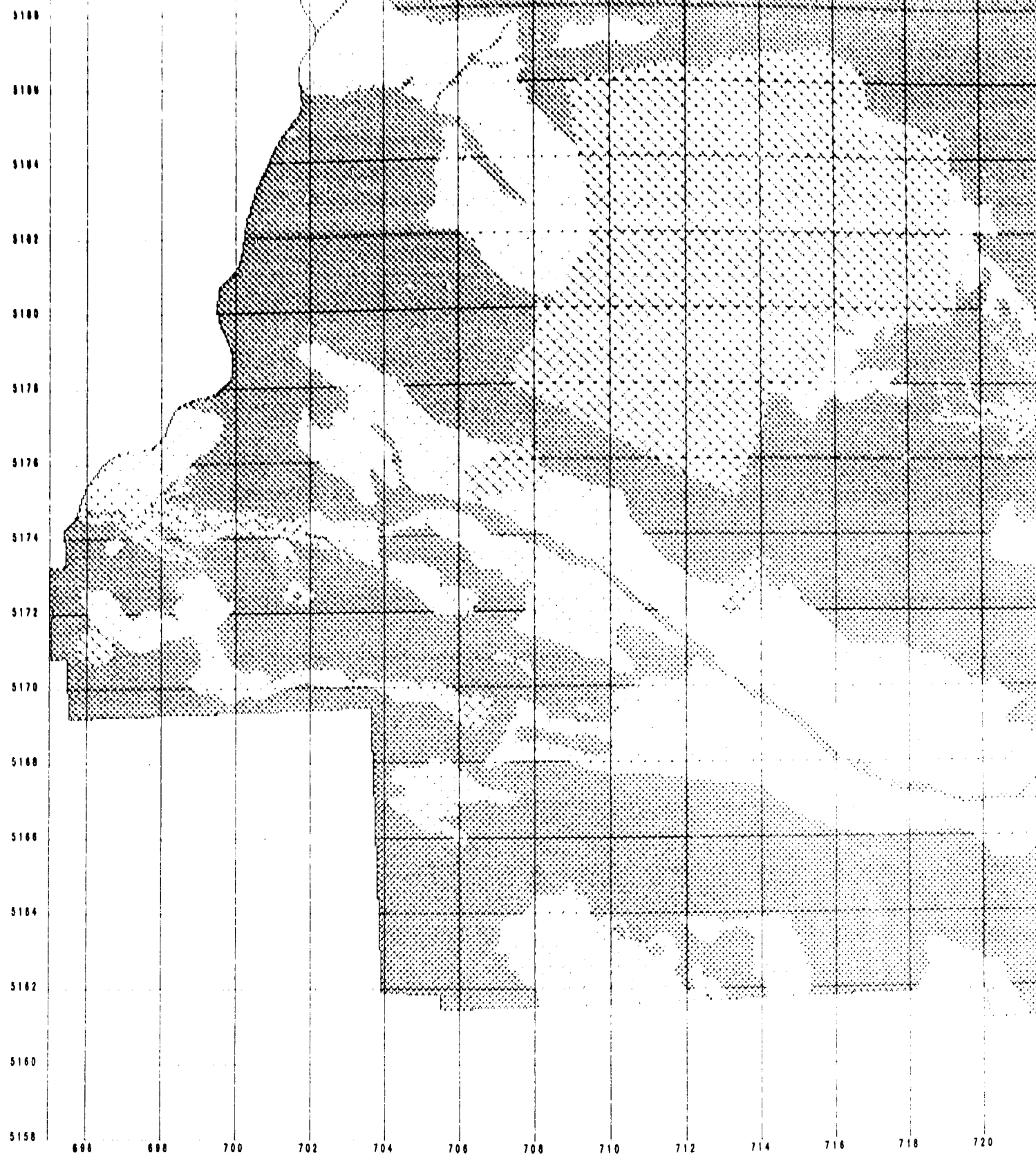
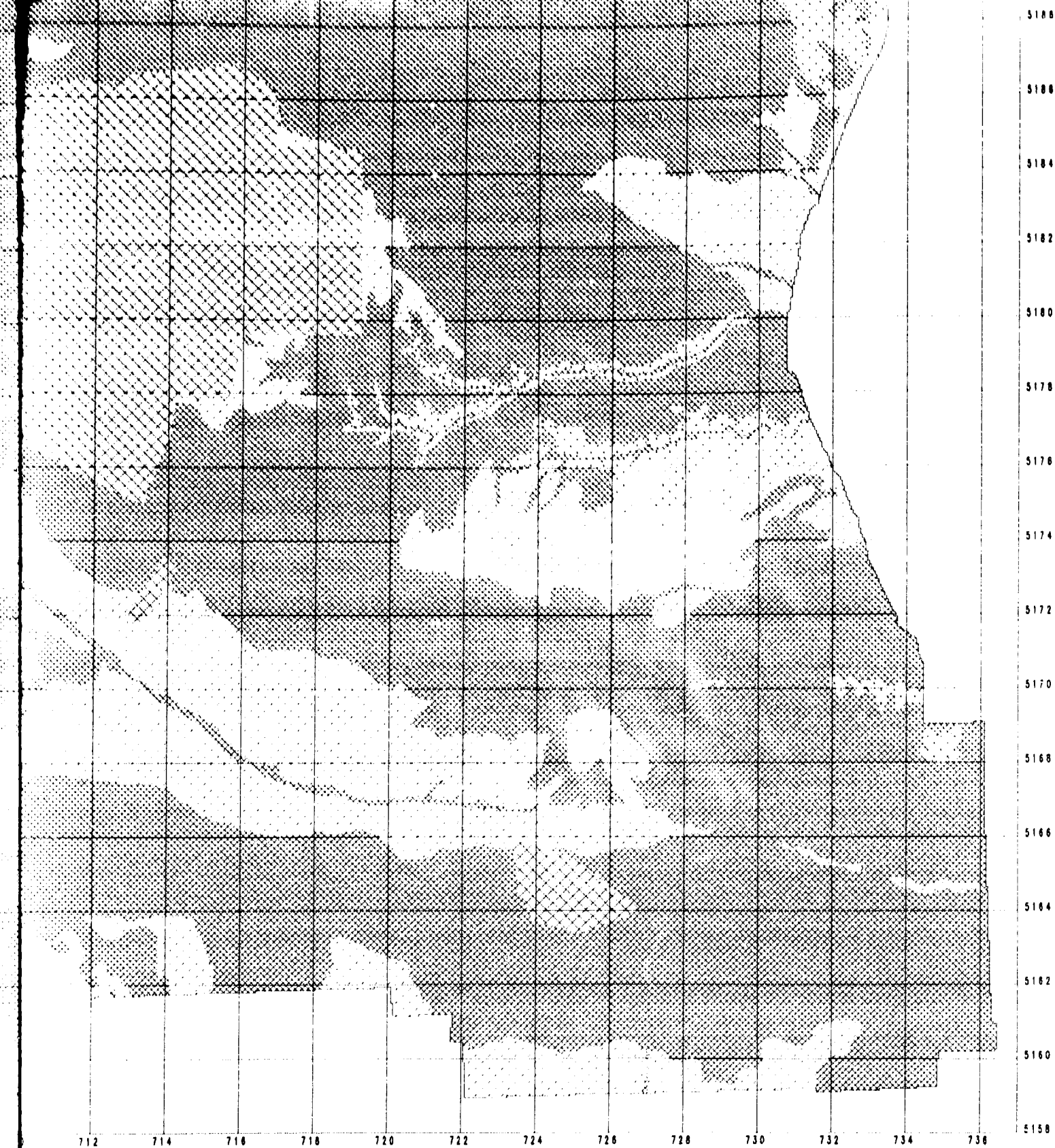
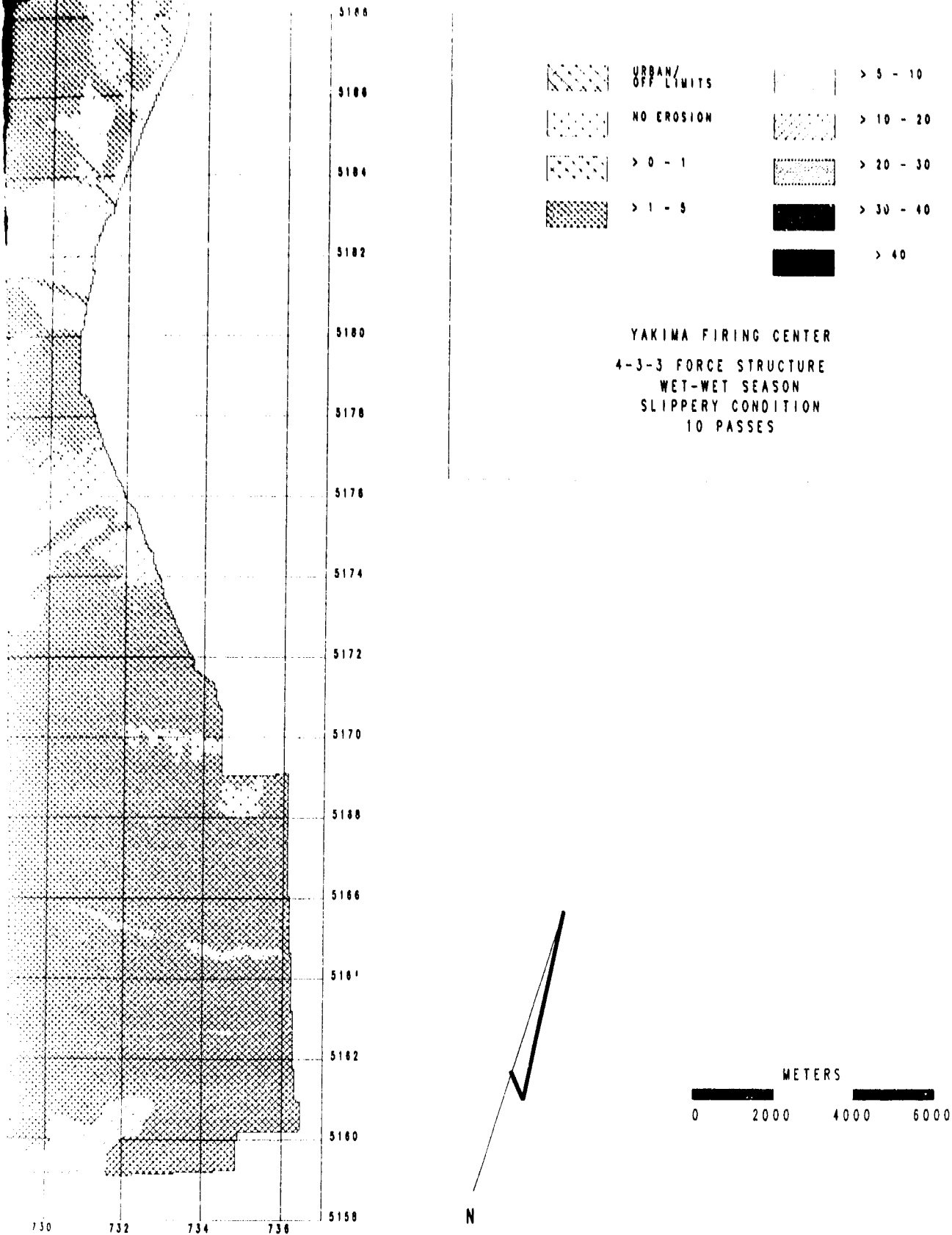


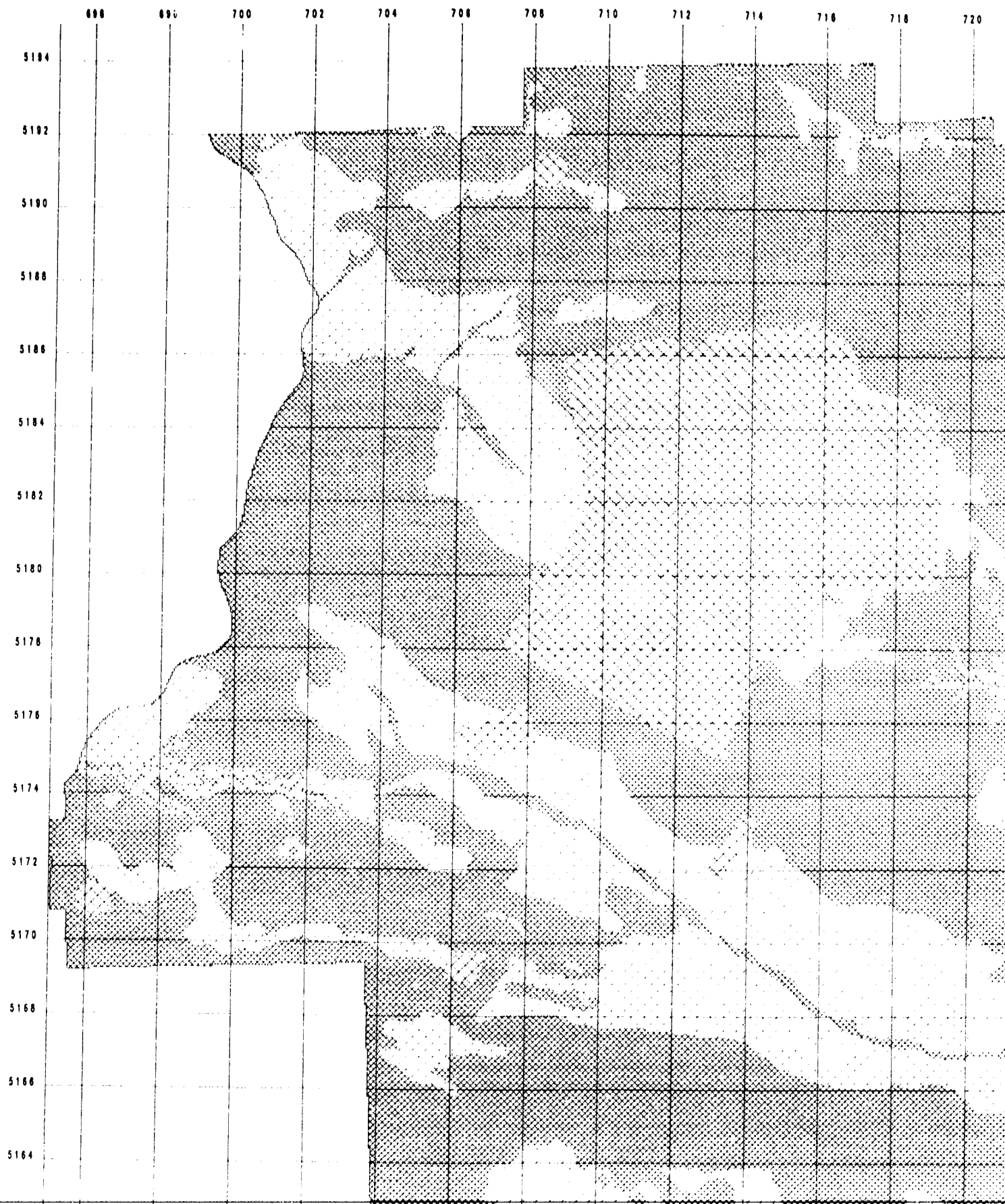
Plate 42. Rate of soil erosion for the 4-3-3 (8X8) fo



Rate of soil erosion for the 4-3-3 (8X8) force structure in the wet-wet slippery surface condition for ten passes



Slippery surface condition for ten passes



712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

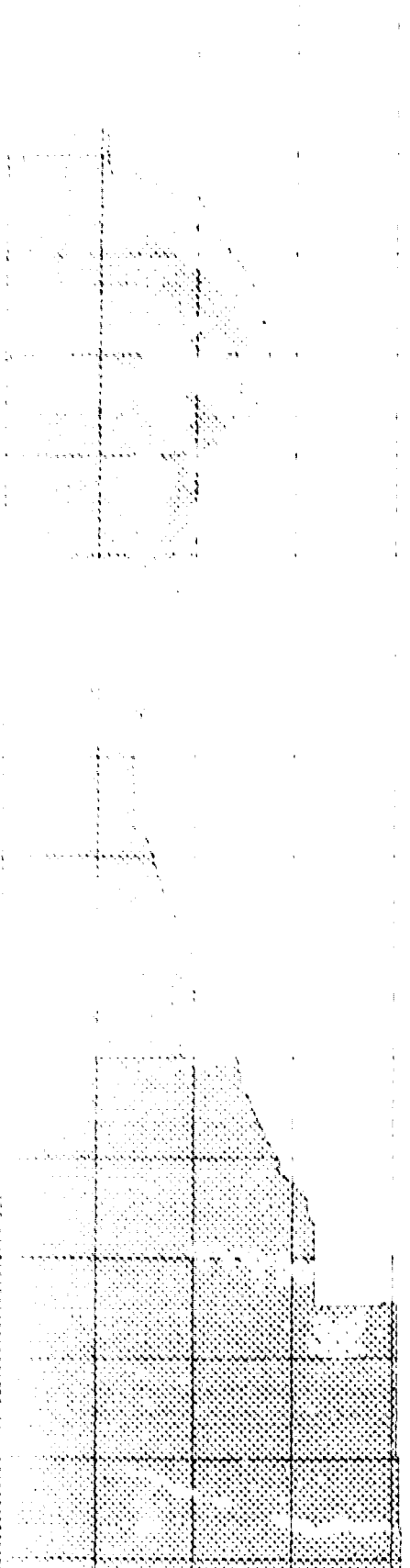
5168

5166

5164



730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

5104
5102
5100
5100
5100
5104
5102
5100
5178
5176
5174
5172
5170
5168
5166
5164

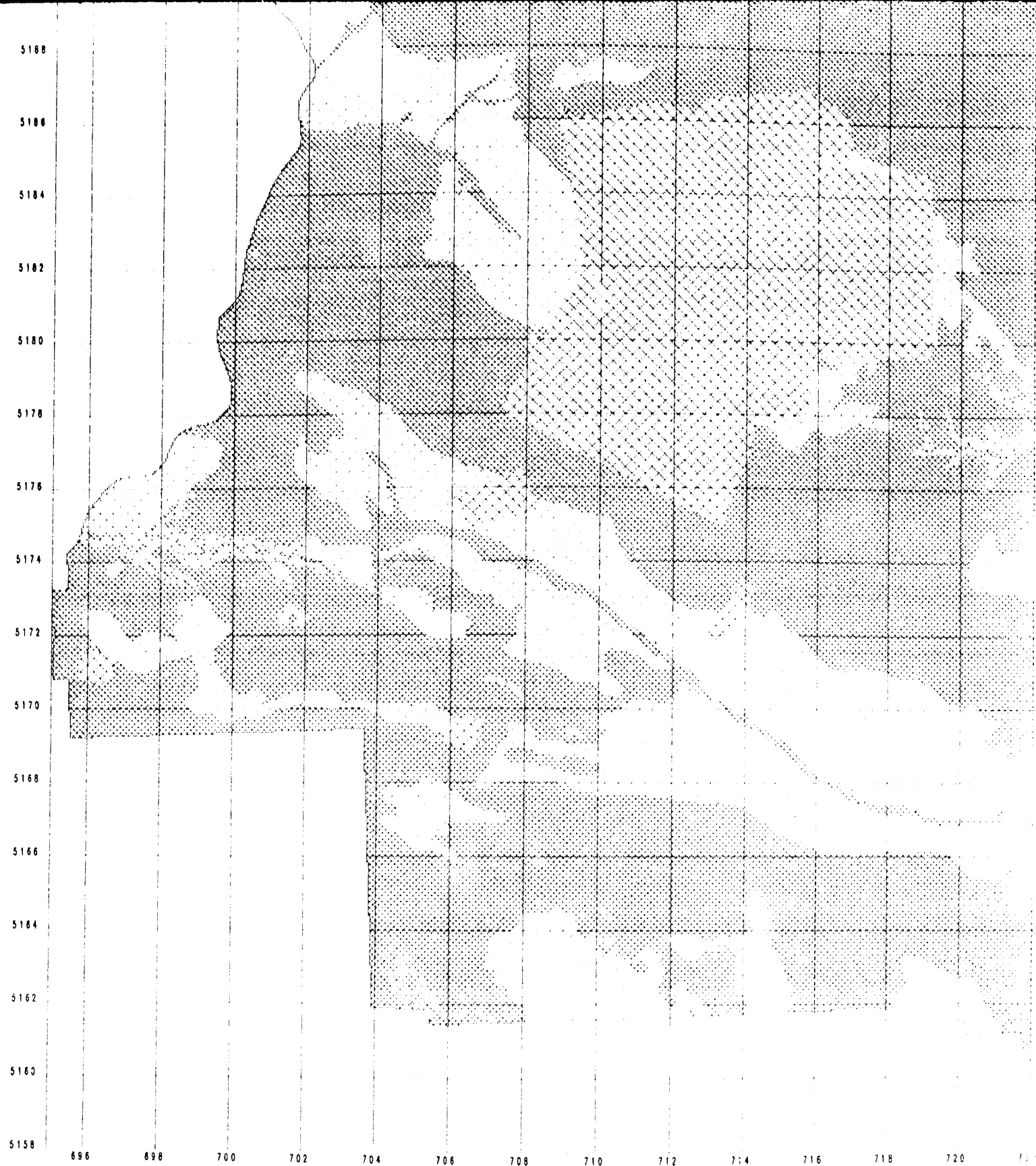
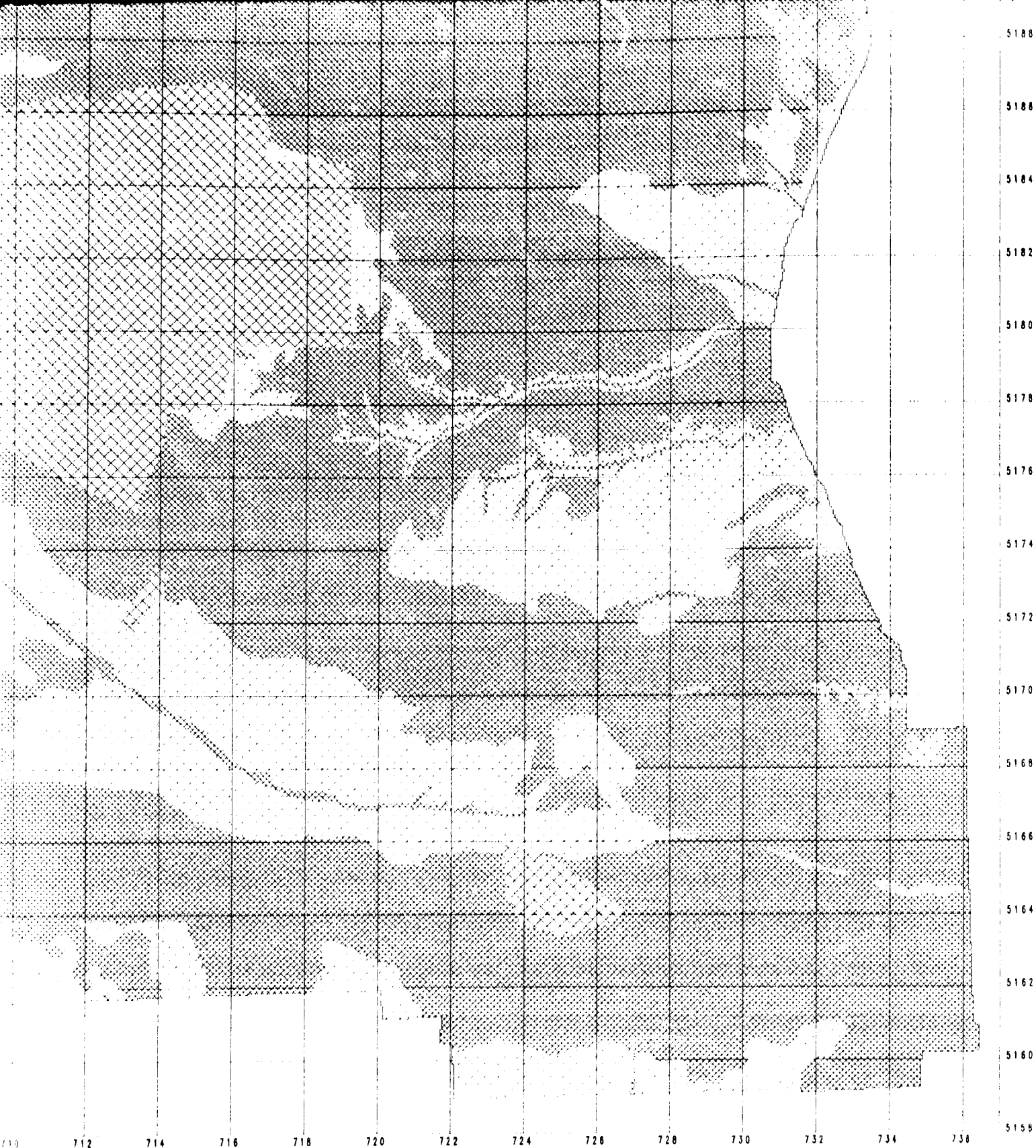
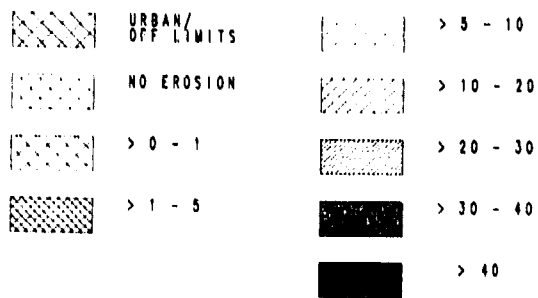
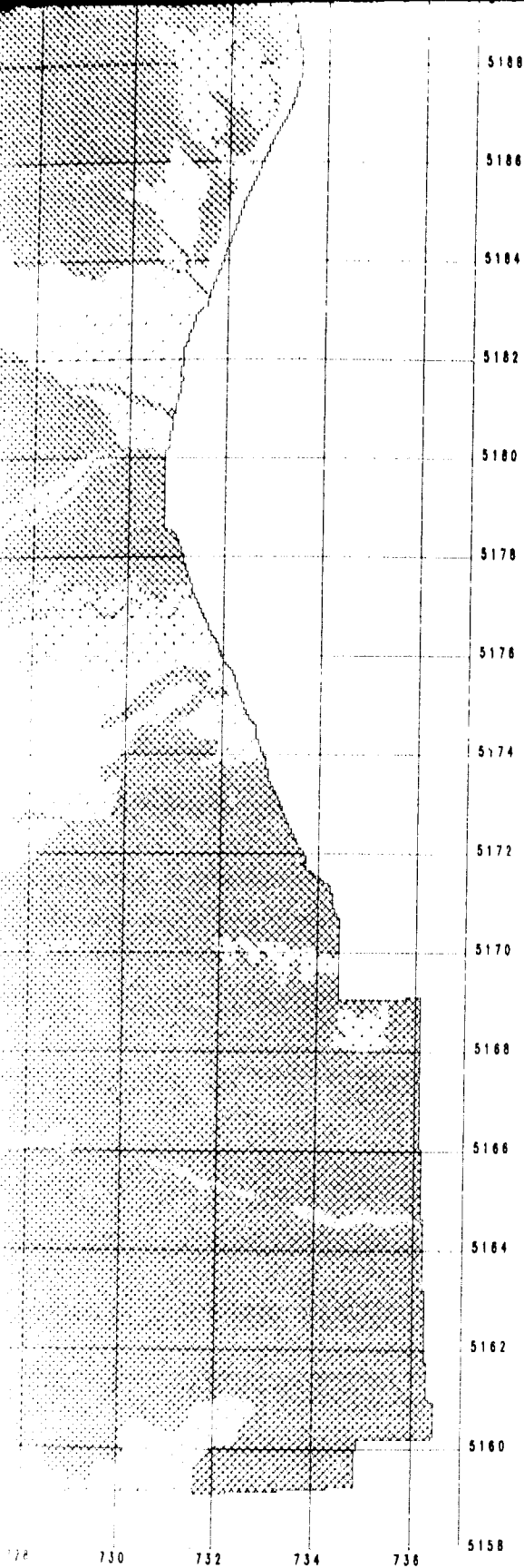


Plate 43. Rate of soil erosion for the 4-3-3 (8X8) force

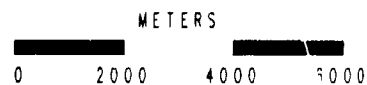
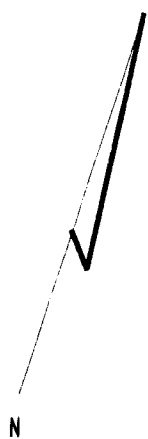


3. Rate of soil erosion for the 4-3-3 (8X8) force structure in the wet-wet slippery surface condition for fifty passes

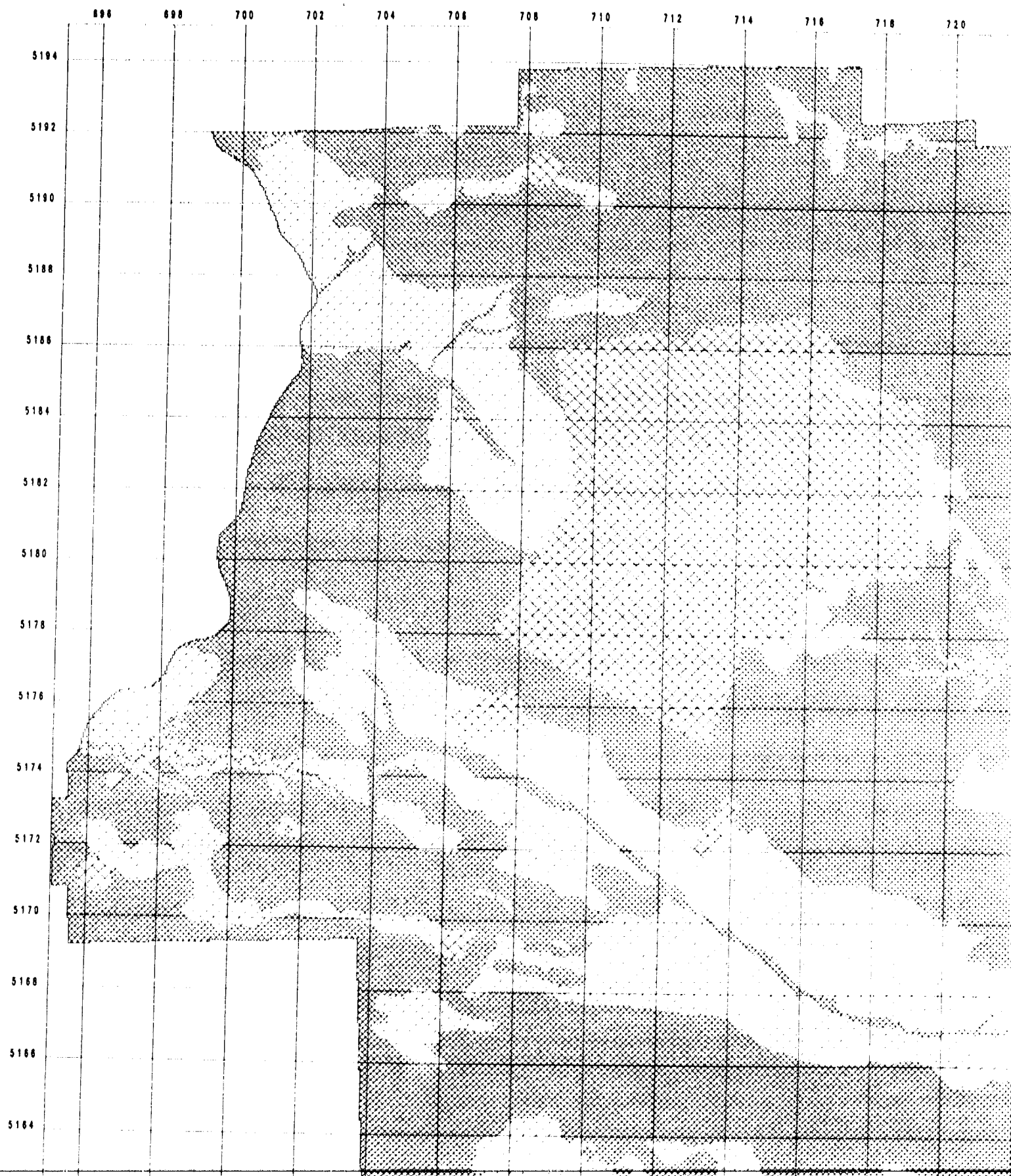
SCALE 1:100000

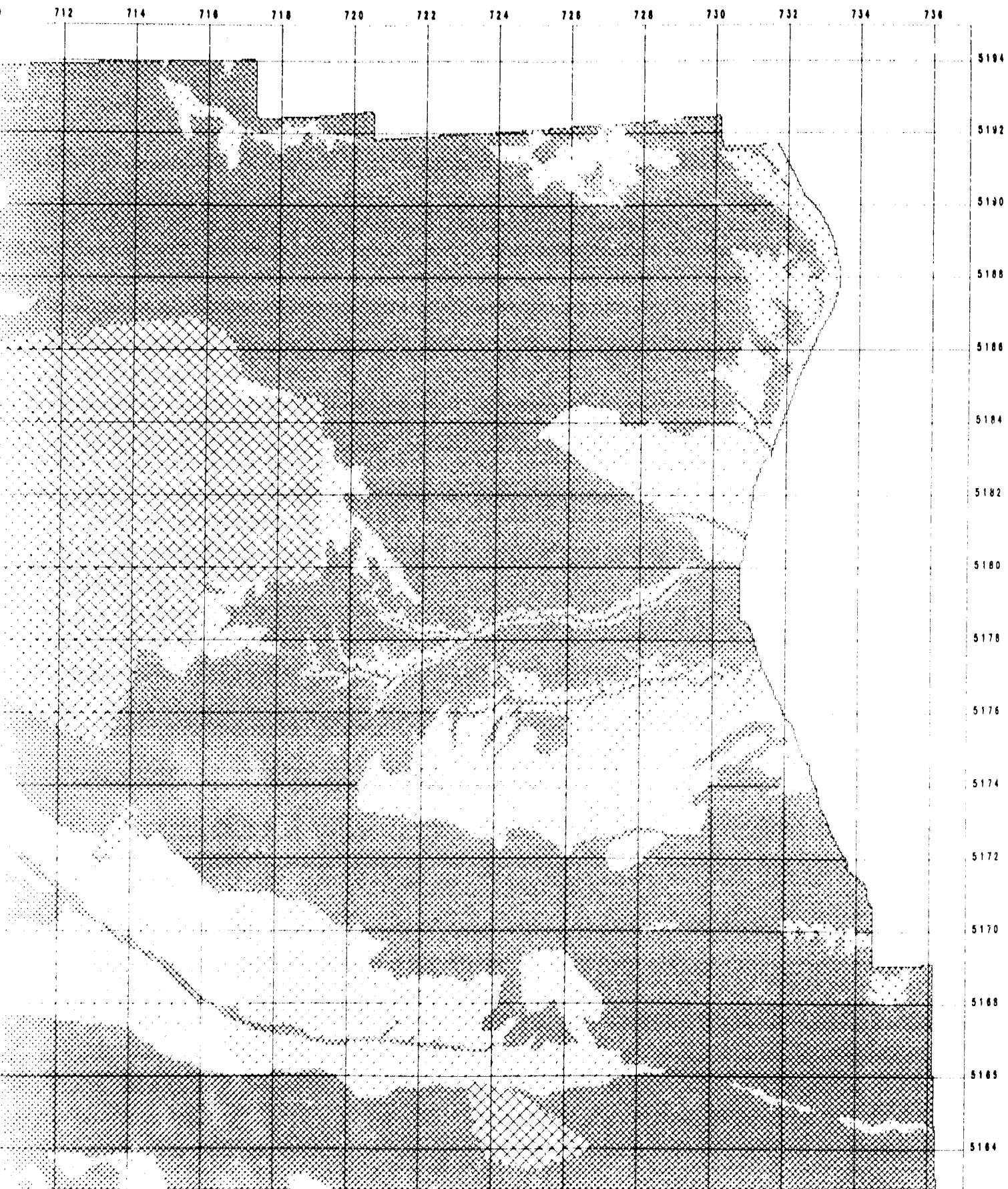


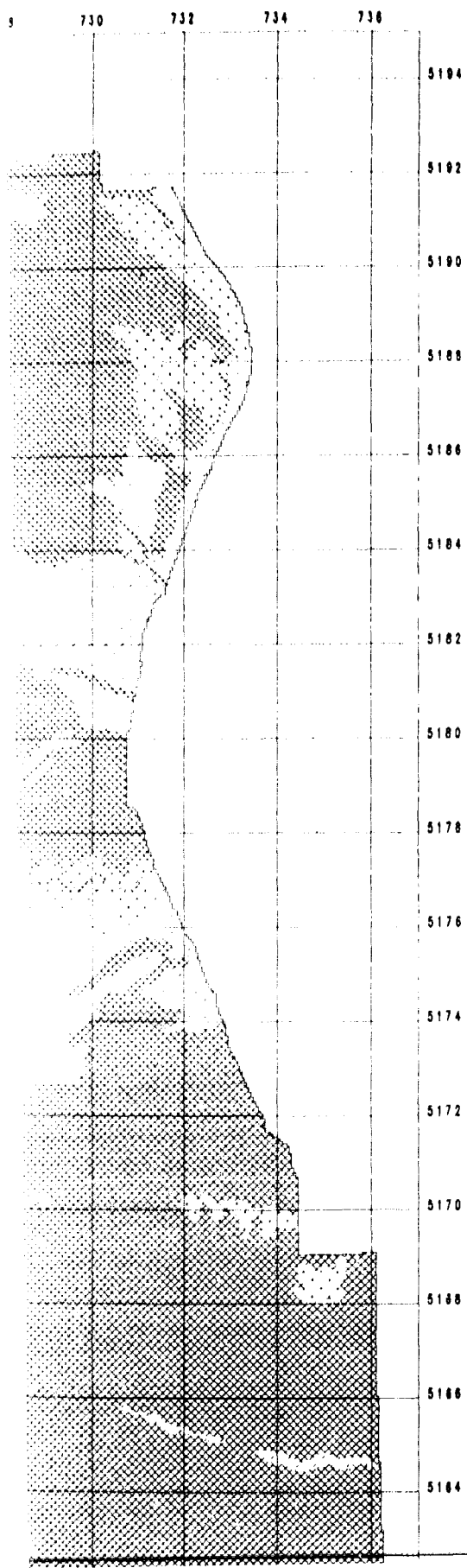
YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES



-wet slippery surface condition for fifty passes
















U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

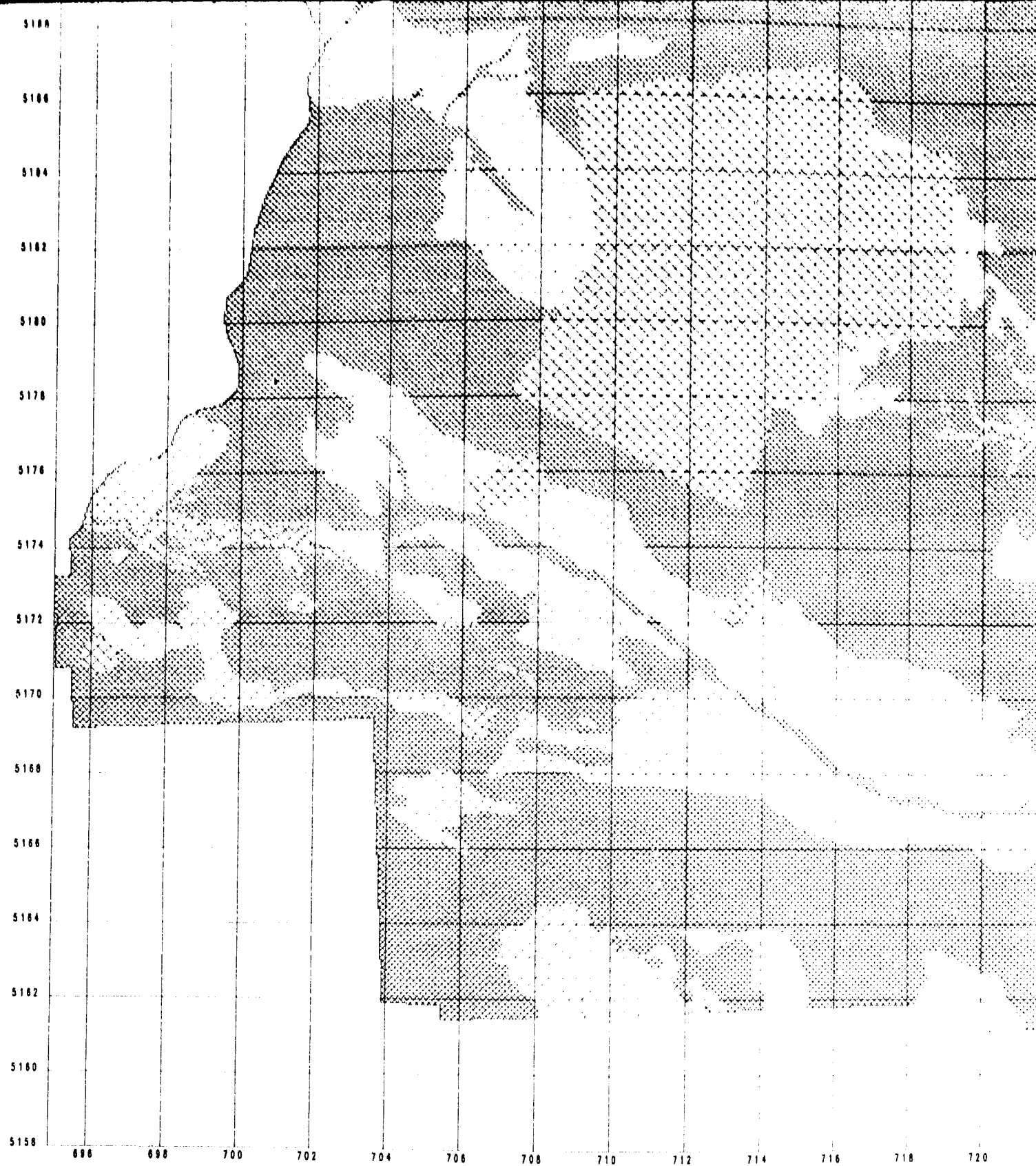
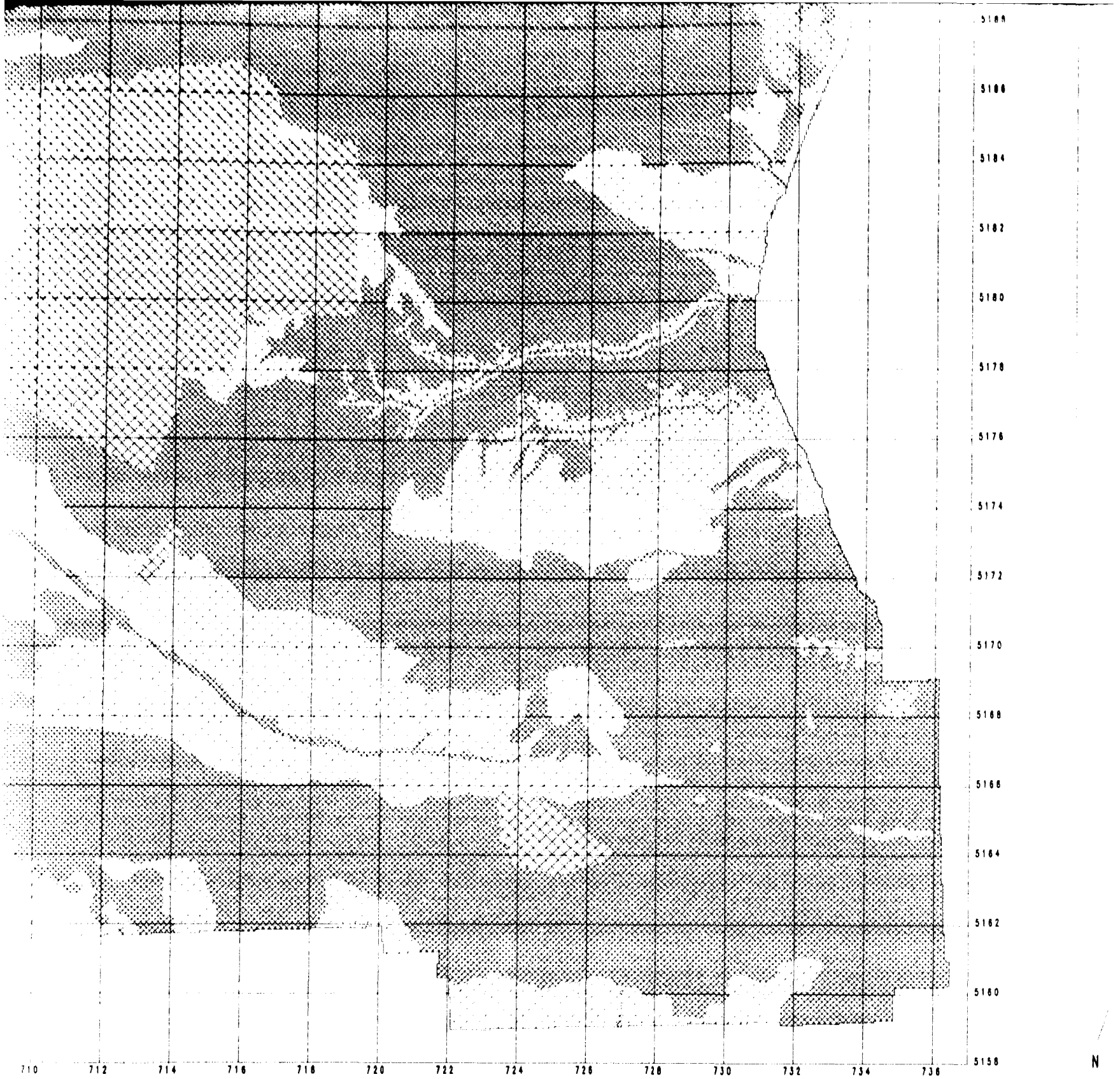
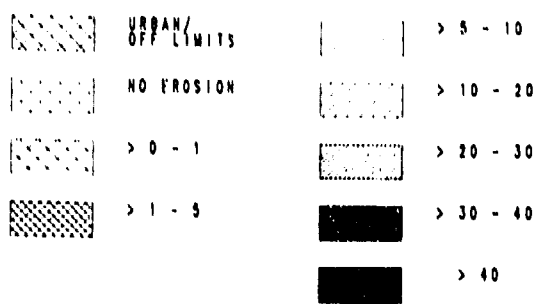
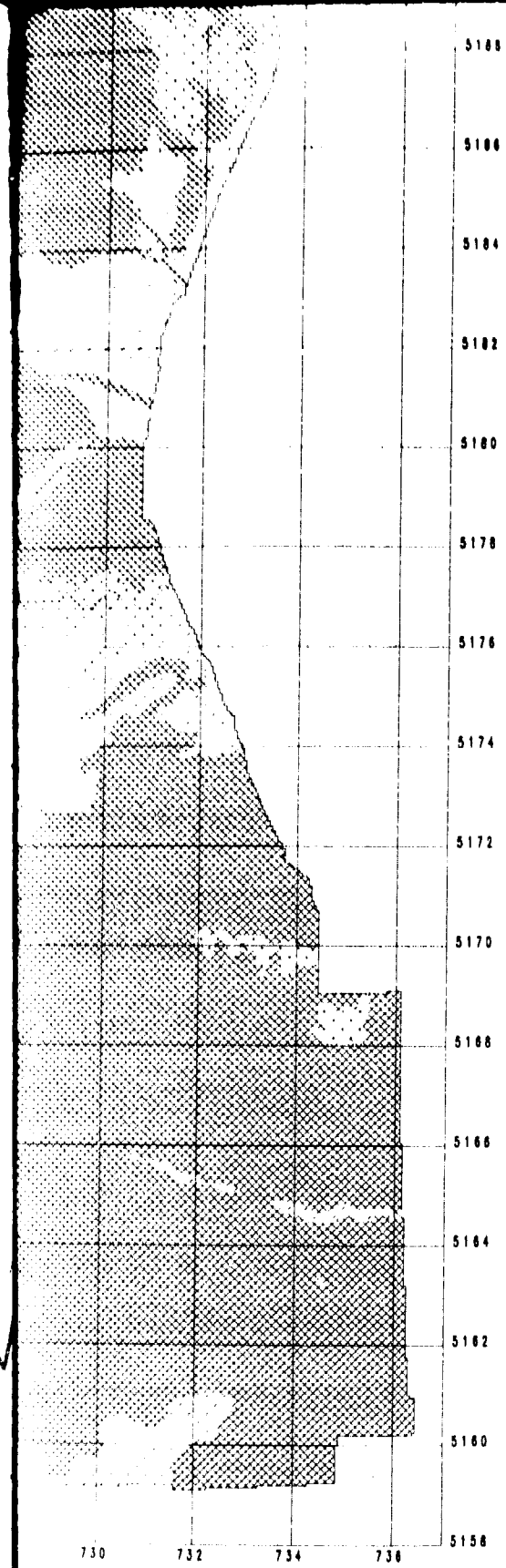


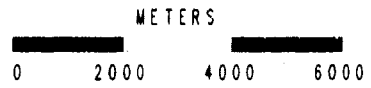
Plate 44. Rate of soil erosion for the 4-3-3 (8x8) for



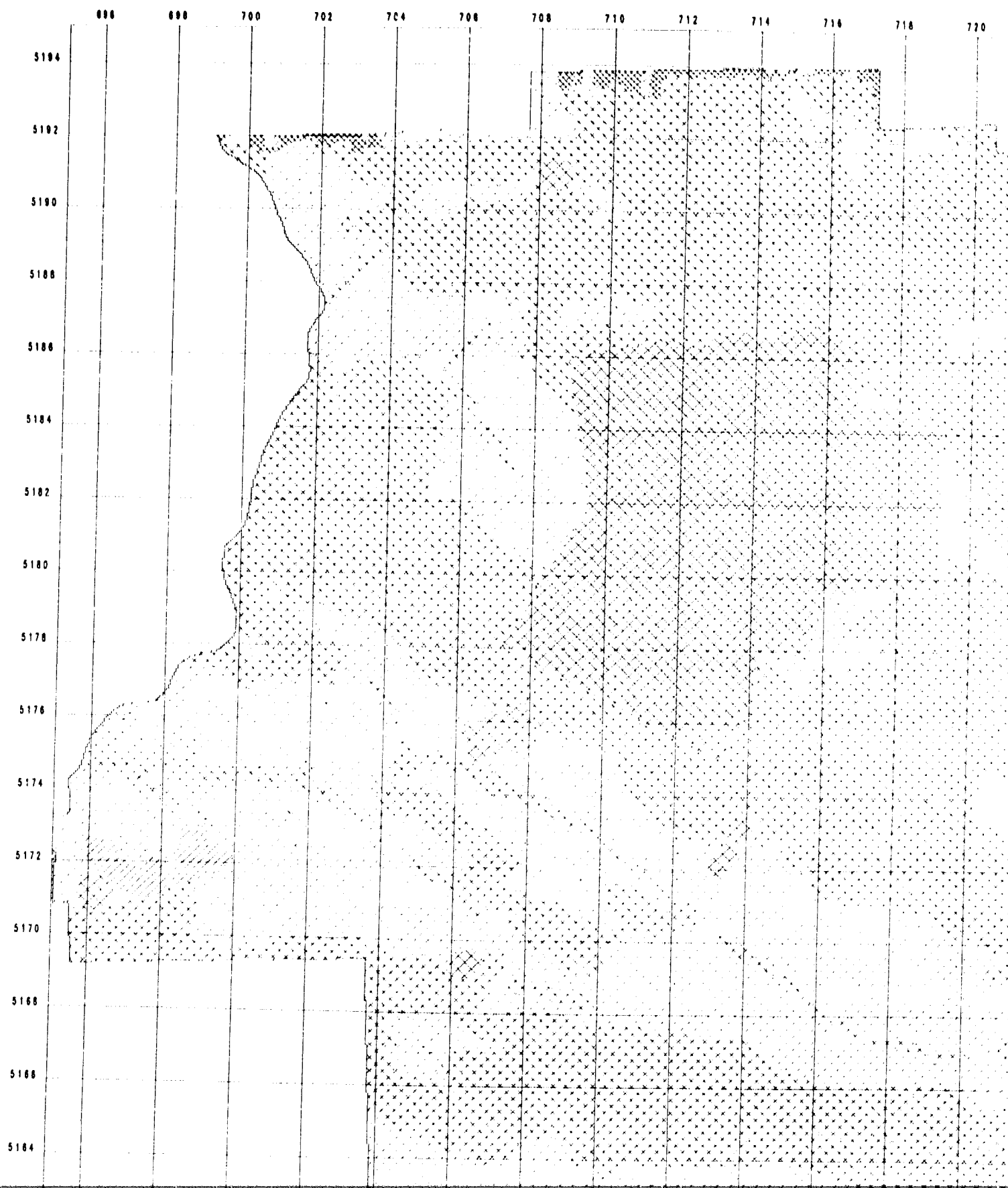
4. Rate of soil erosion for the 4-3-3 (8x8) force structure in the wet-wet slippery surface condition for one thousand passes

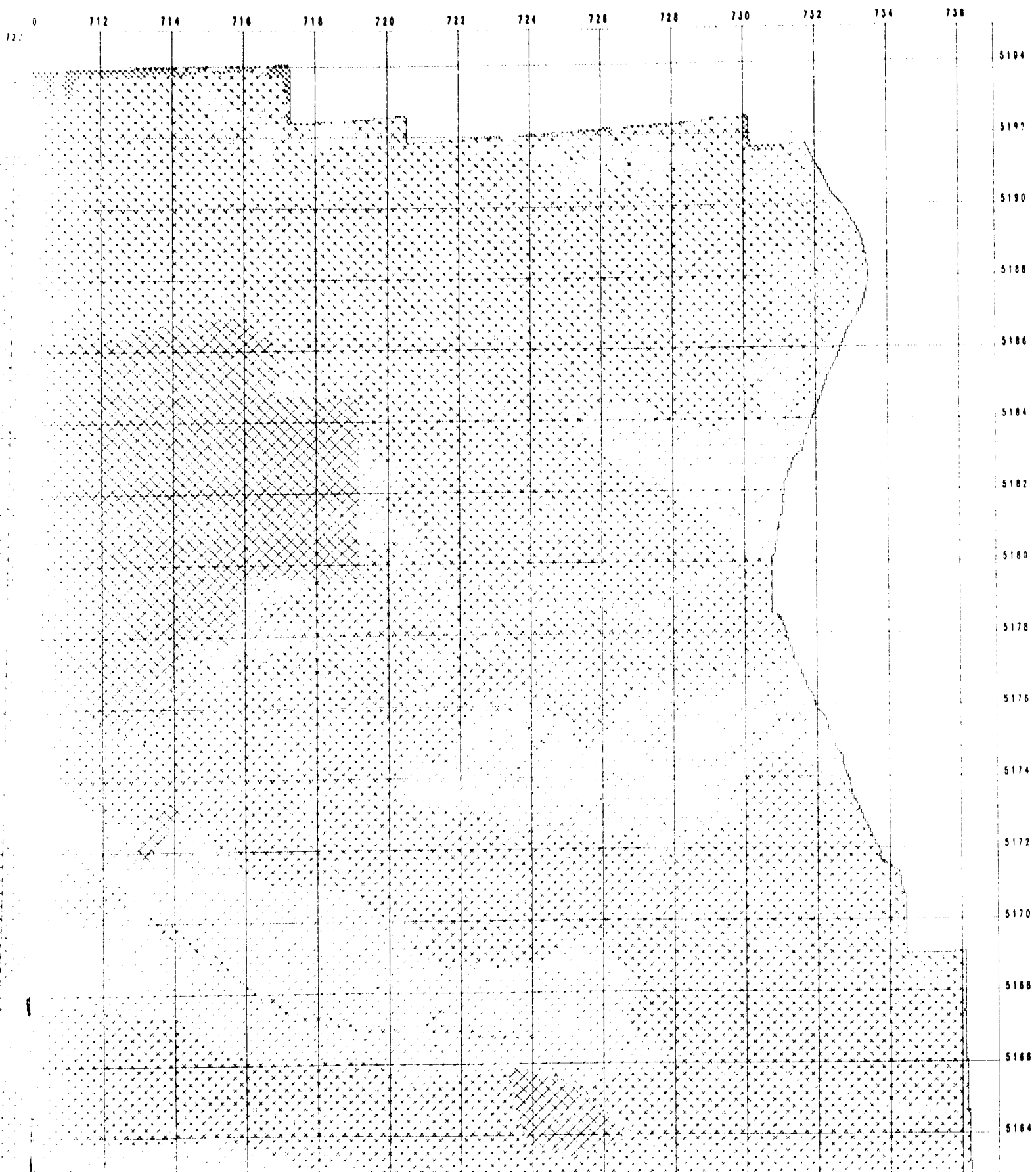


YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES



Slippery surface condition for one thousand passes







728 730 732 734 736

5184

5182

5180

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5188

5186

5184



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

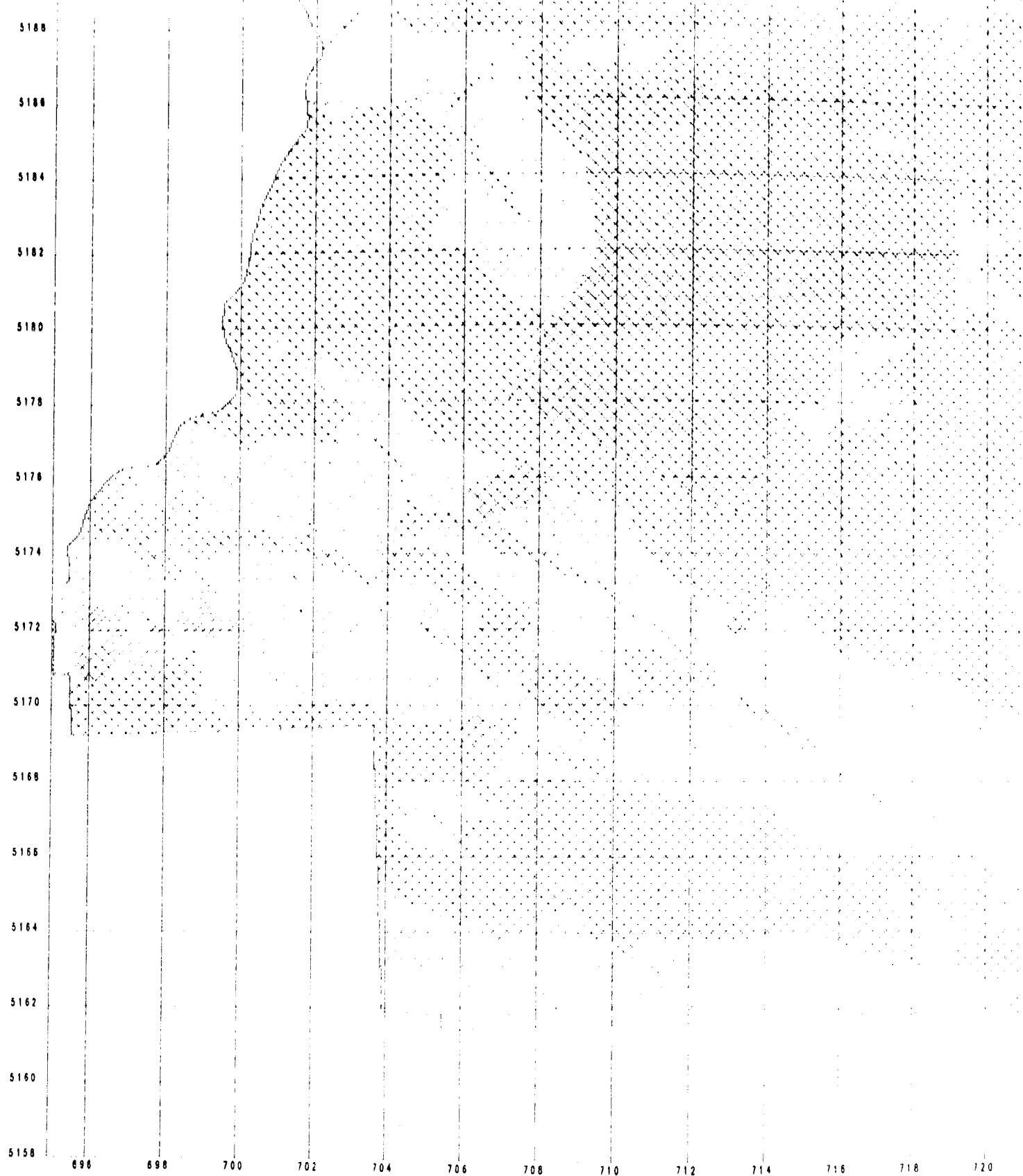
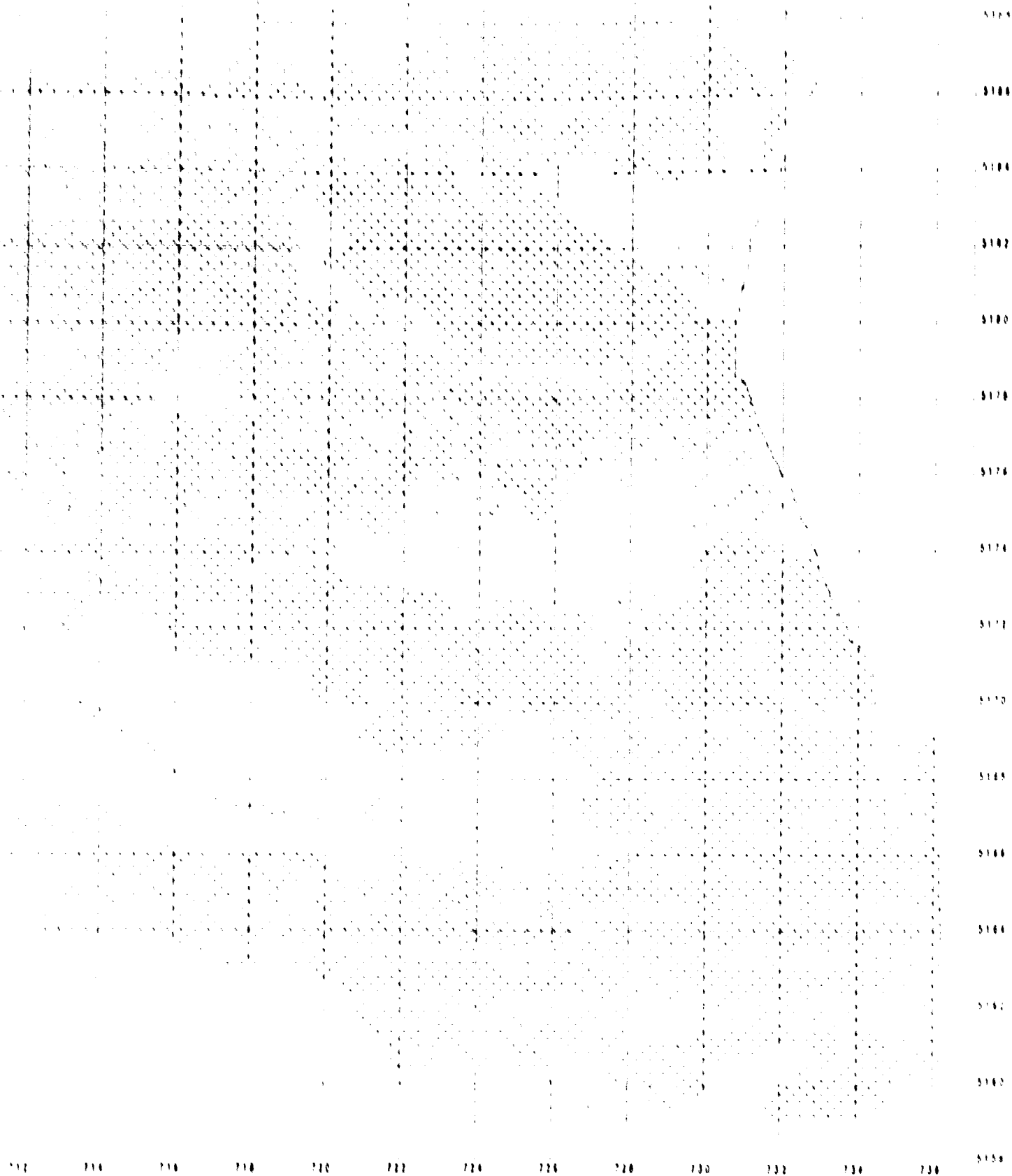
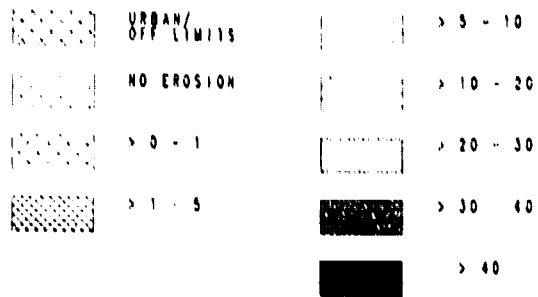


Plate 45. Rate of soil erosion for the 5-5-0

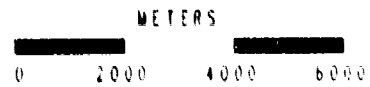


45. Rate of soil erosion for the 5-5-0 force structure in the dry normal surface condition for ten passes

SCALE 1:100000

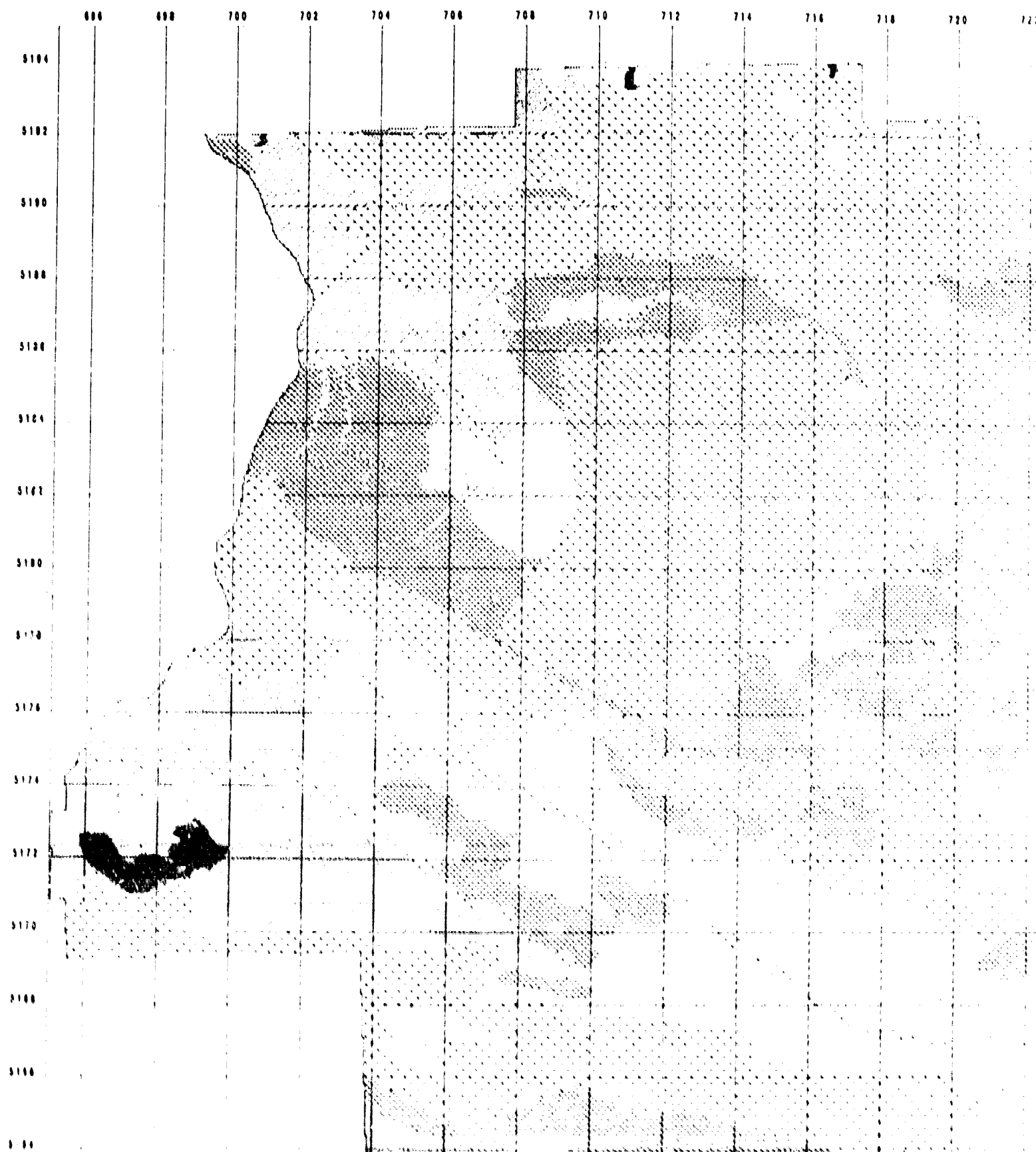


YAKIMA FIRING CENTER
S-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES



N

ry normal surface condition for ten passes



712 714 716 718 720 722 724 726 728 730 732 734 736

5104
5102
5100
5098
5096
5094
5092
5090
5088
5086
5084
5082
5080
5078
5076
5074
5072
5070
5068
5066
5064



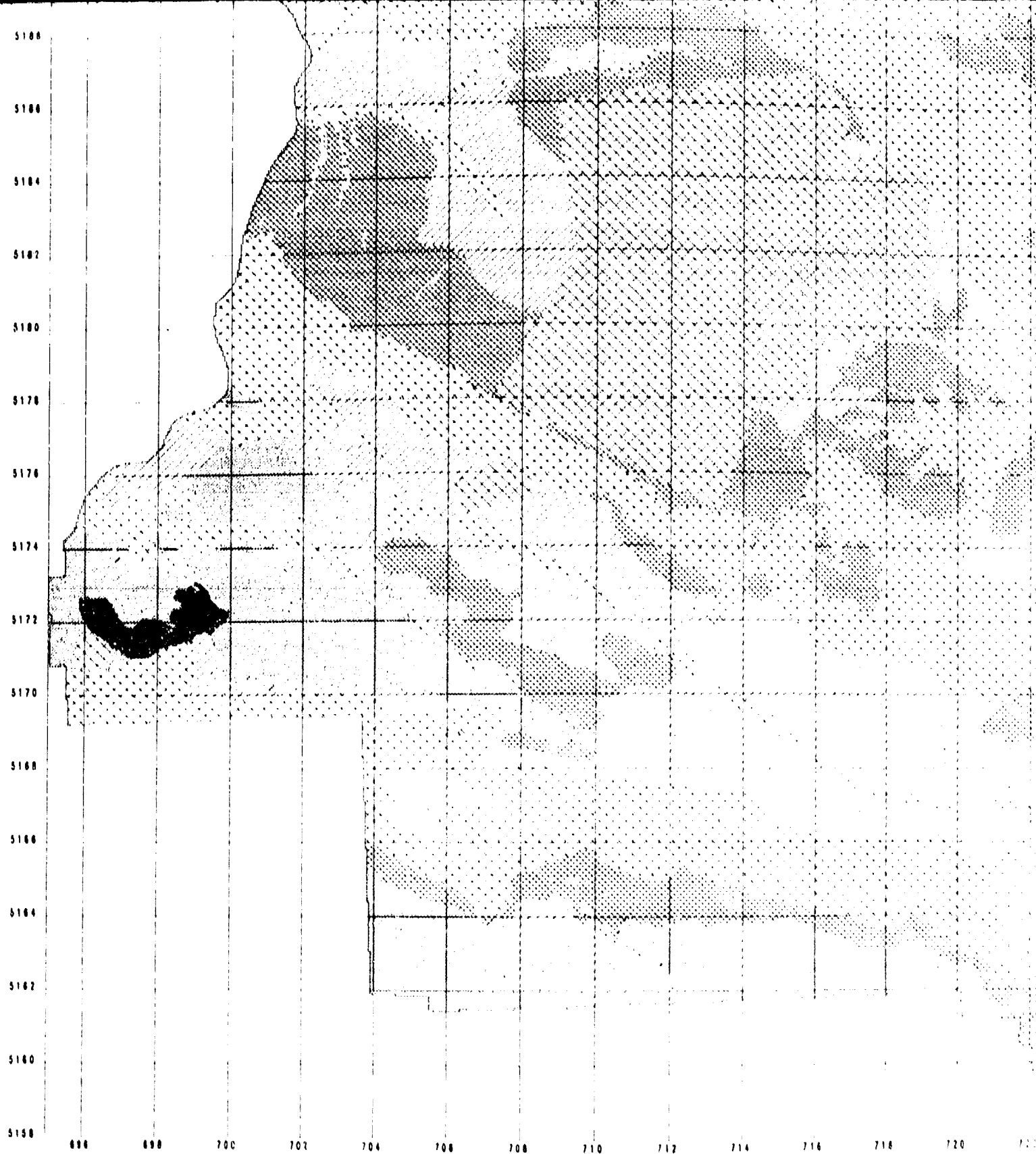


Plate 46. Rate of soil erosion for the 5-5-0 for

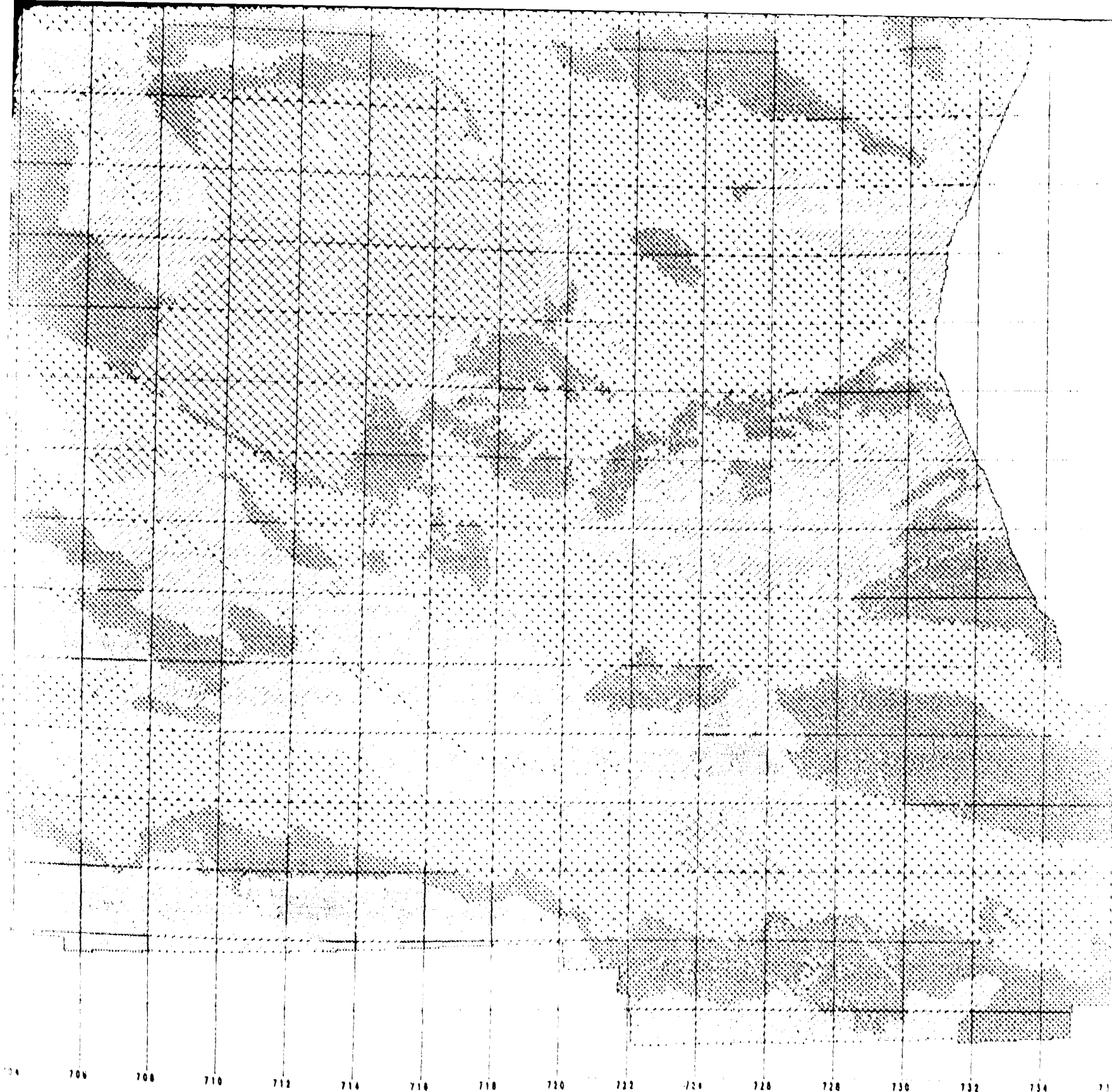
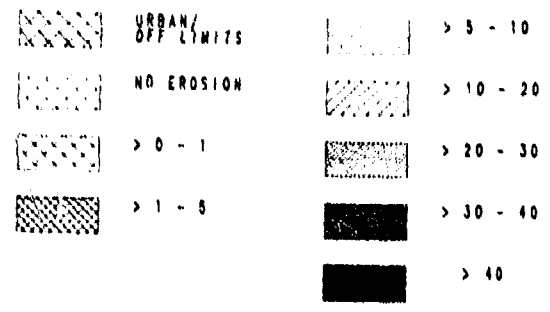
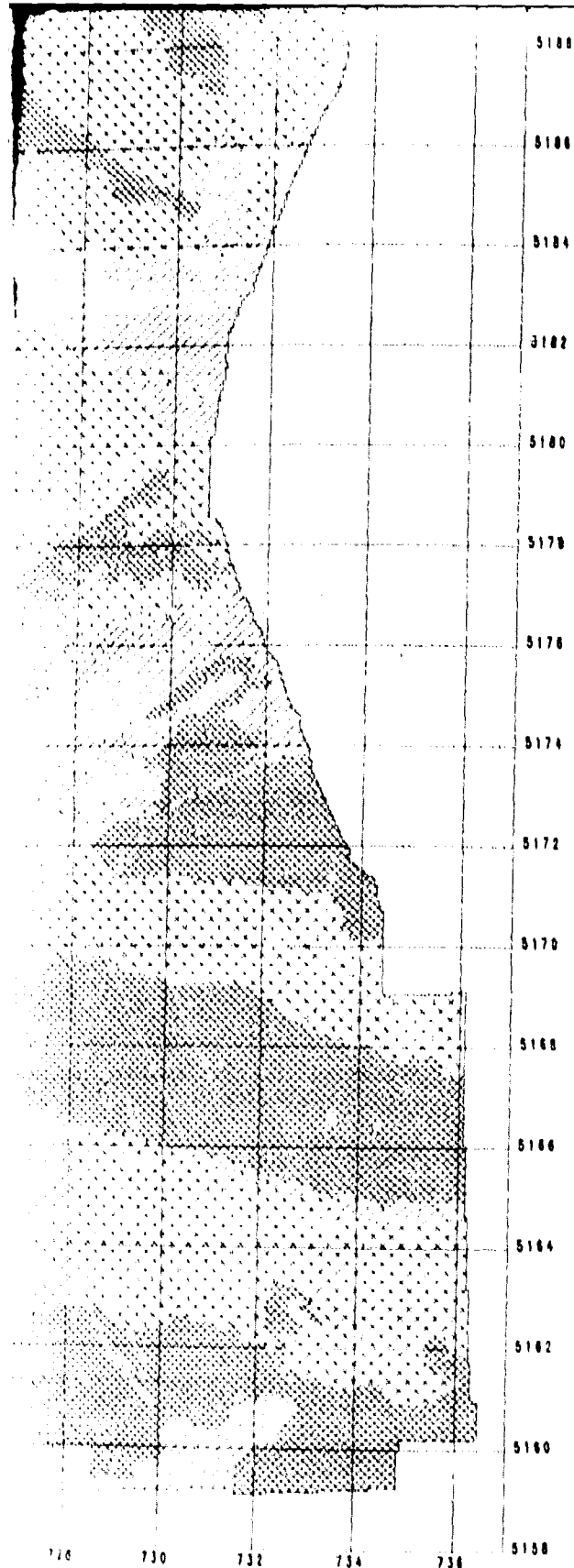


Plate 46. Rate of soil erosion for the 5-5-0 force structure in the dry normal surface condition for f

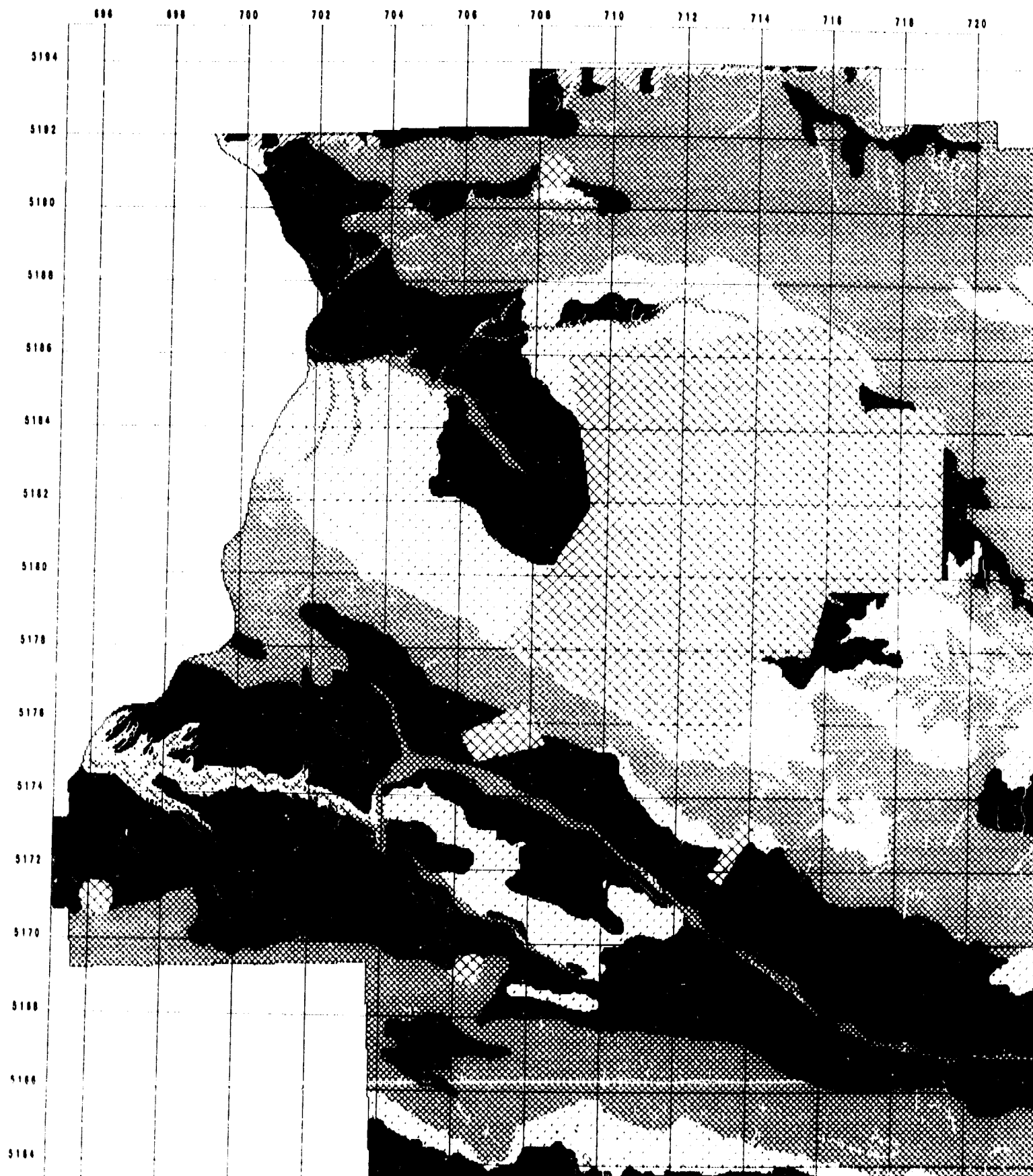
SCALE 1:100000

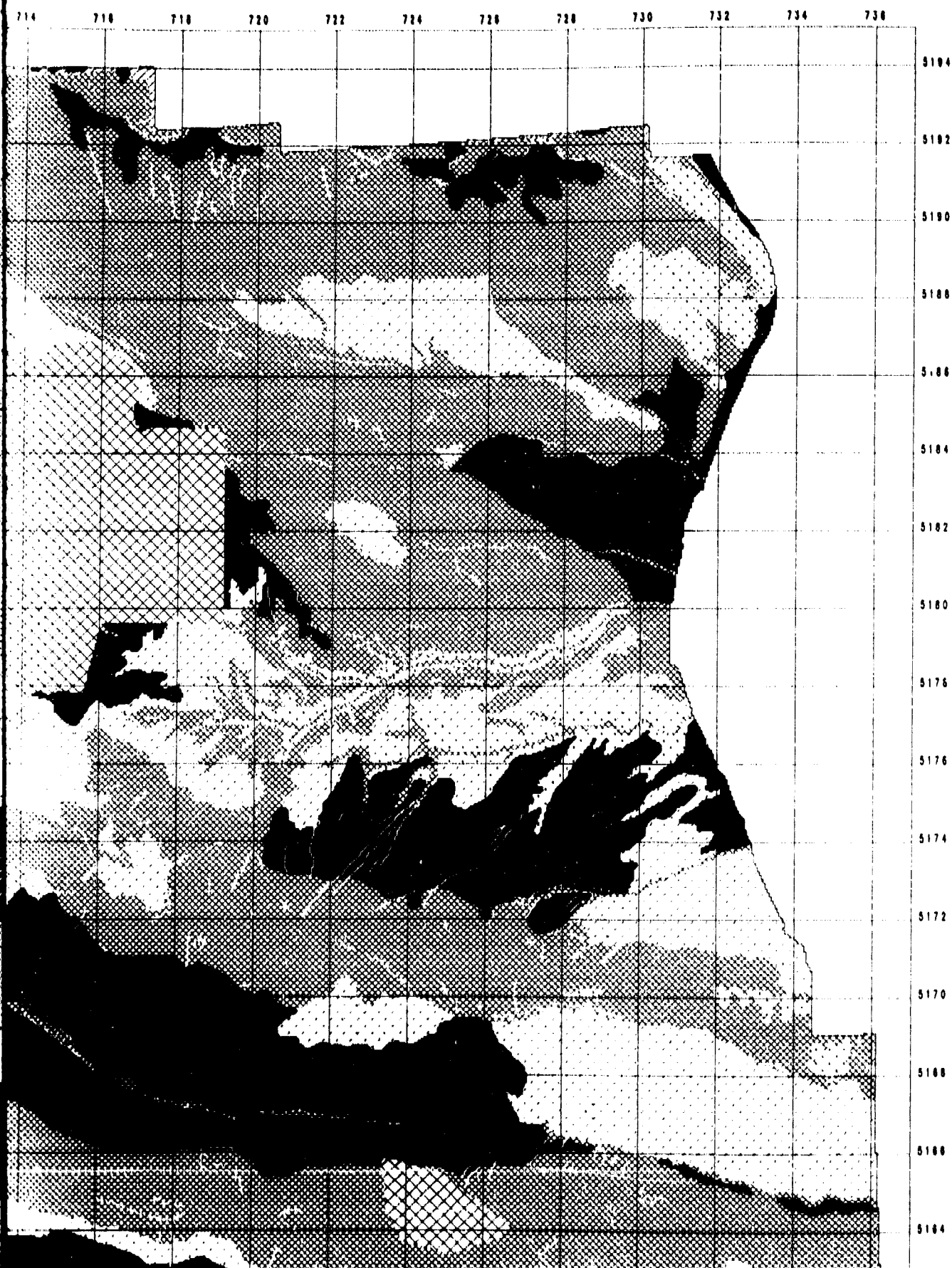


YAKIMA FIRING CENTER
S-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES



dry normal surface condition for fifty passes





U. S.
Wat
Exp
Sta

RATE (TO
(TO
SC



URBAN/
OFF L



NO ERO

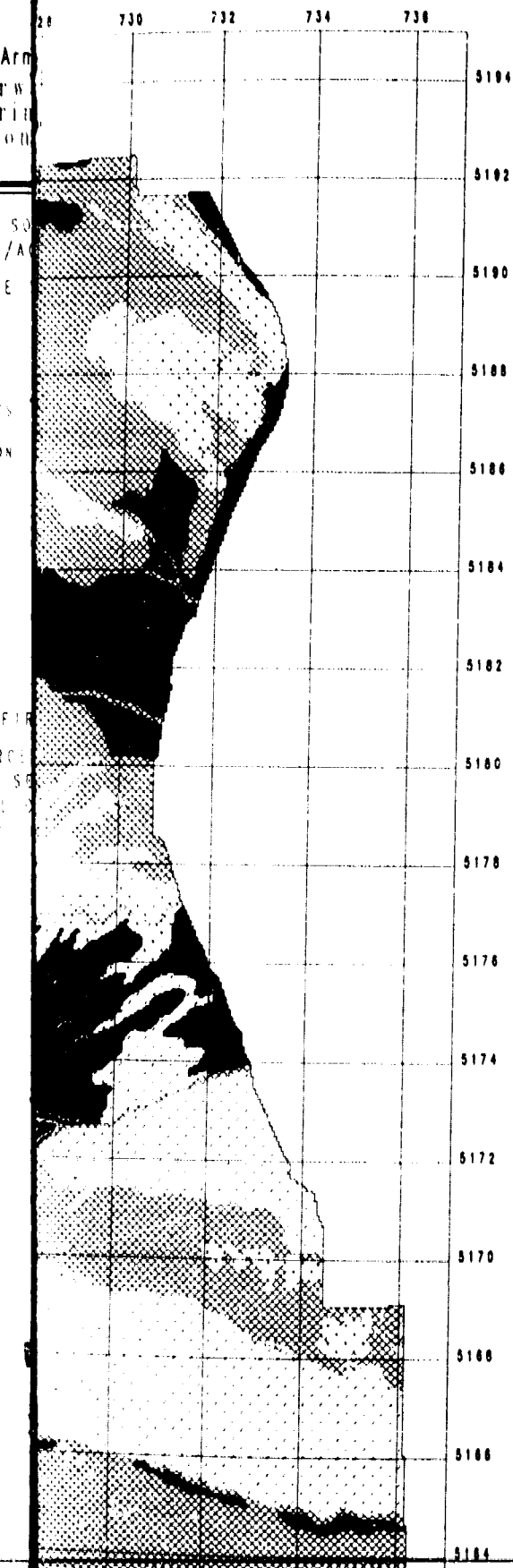


> 0 -



> 1 -










YAKIM
5-5-0 F
D
NOR
1



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

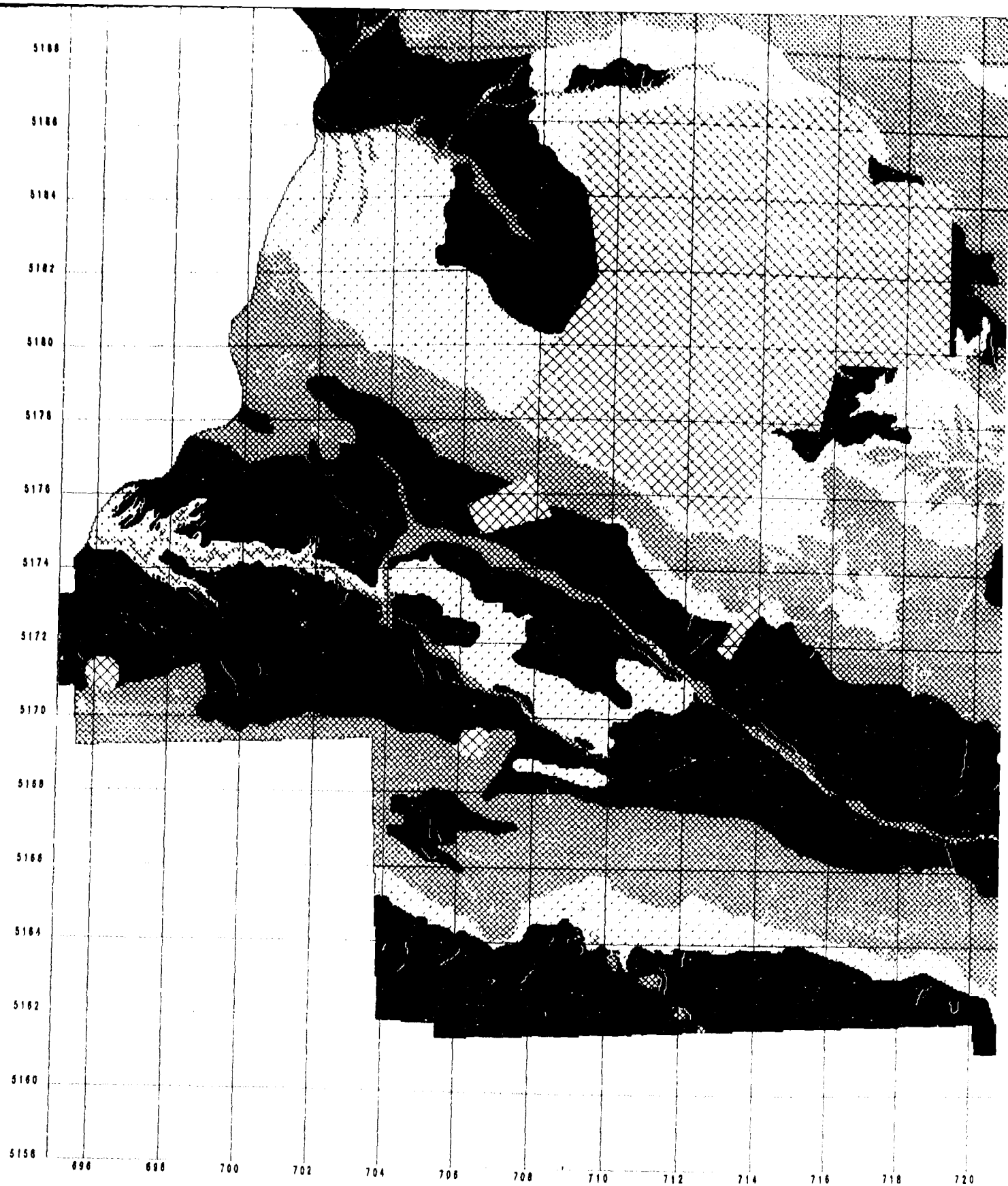


Plate 47. Rate of soil erosion for the 5-5-0 force s

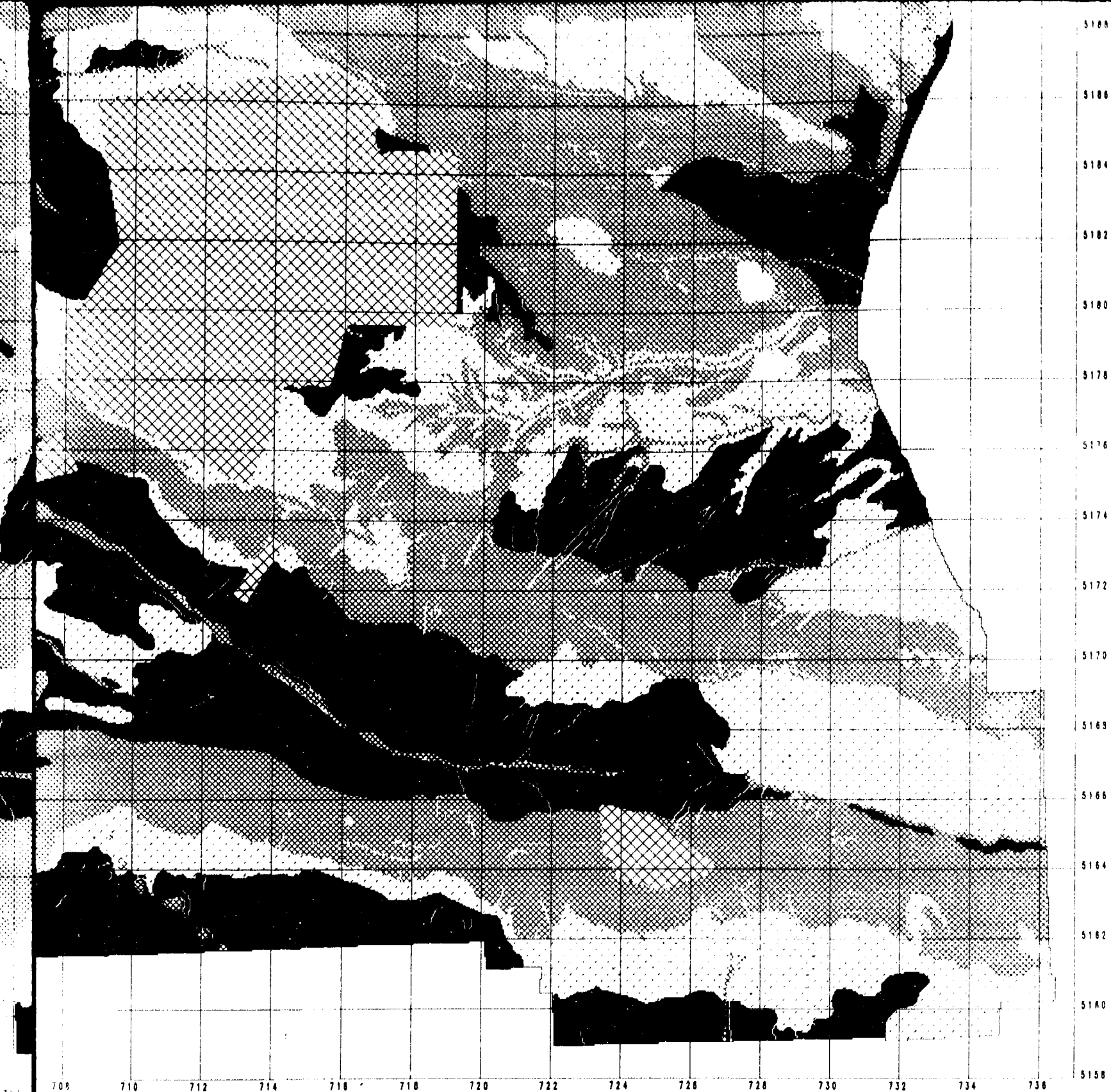
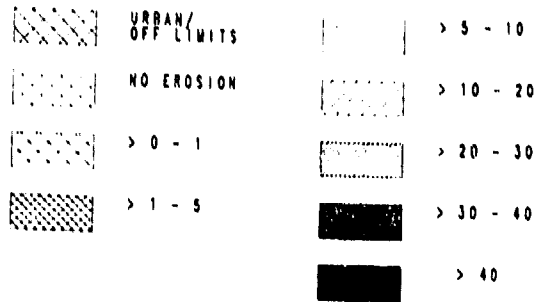
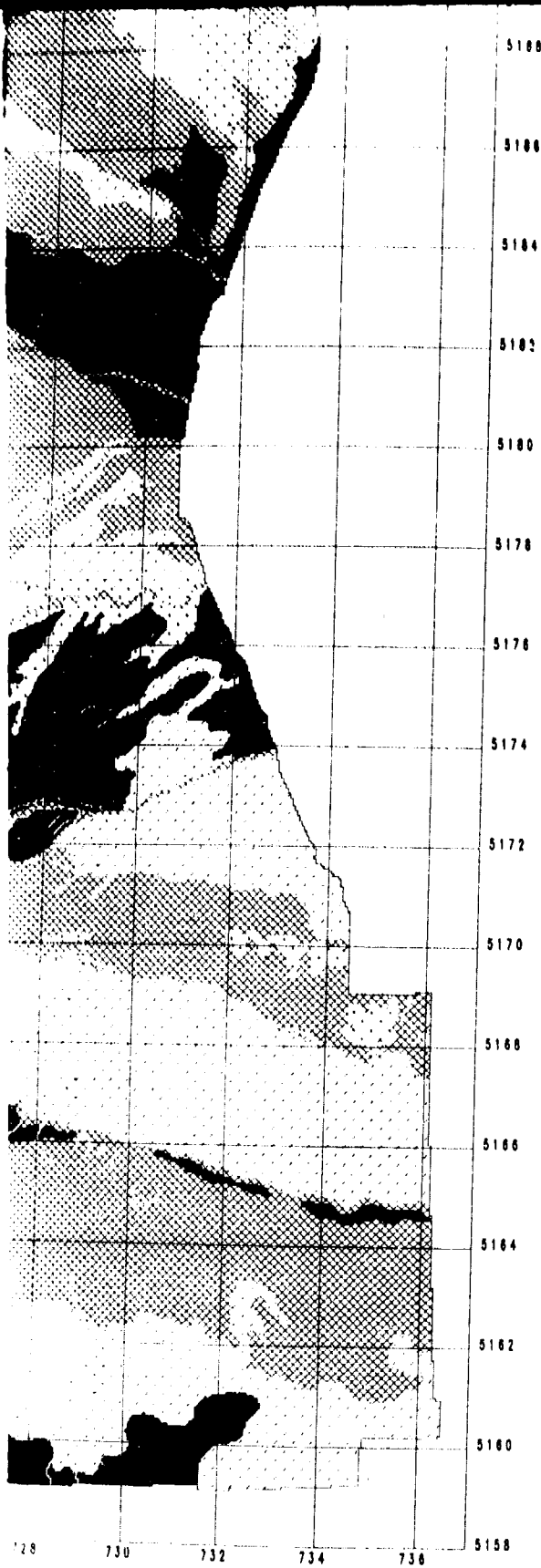
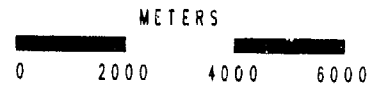


Plate 47. Rate of soil erosion for the 5-5-0 force structure in the dry normal surface condition for one thousand passes

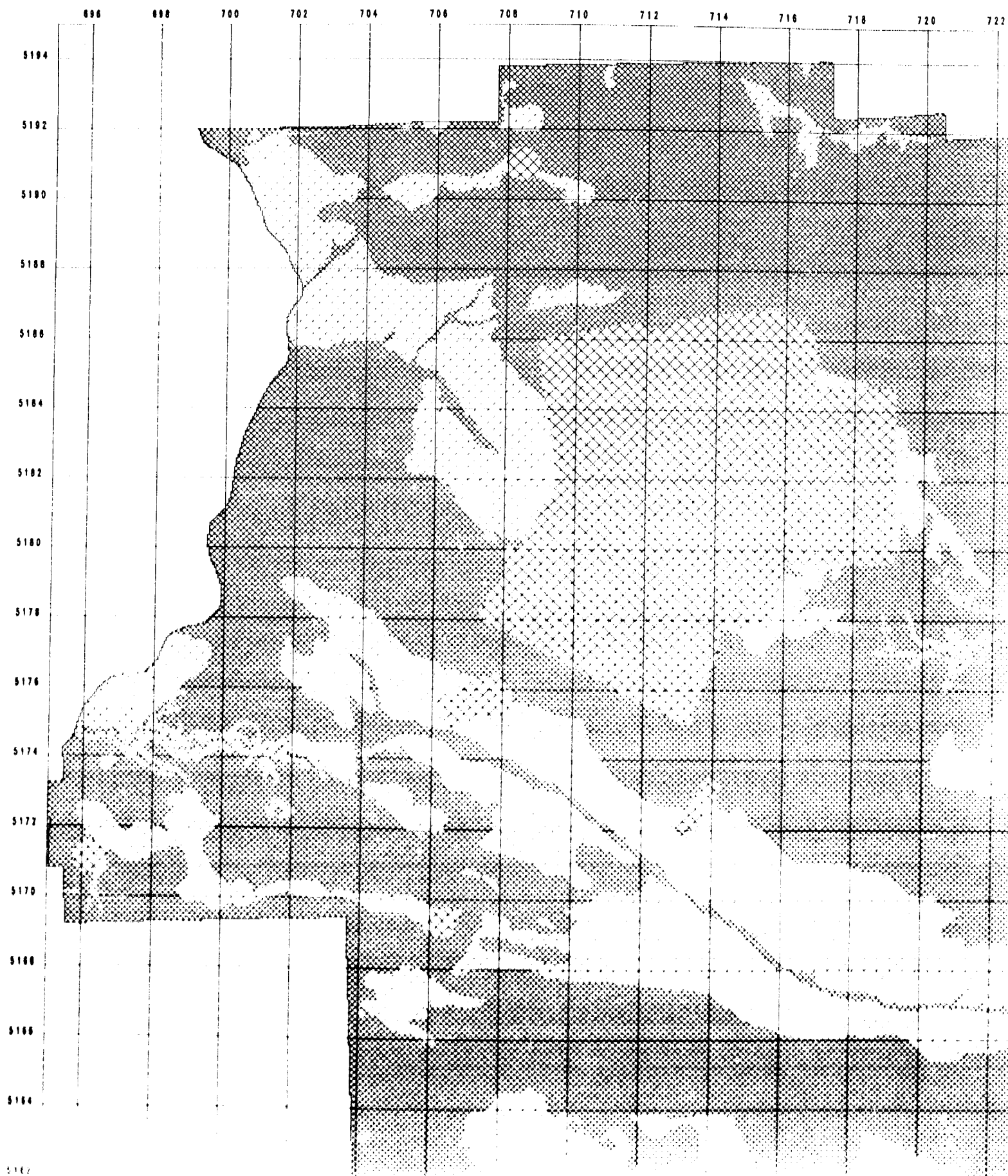
SCALE 1:100000

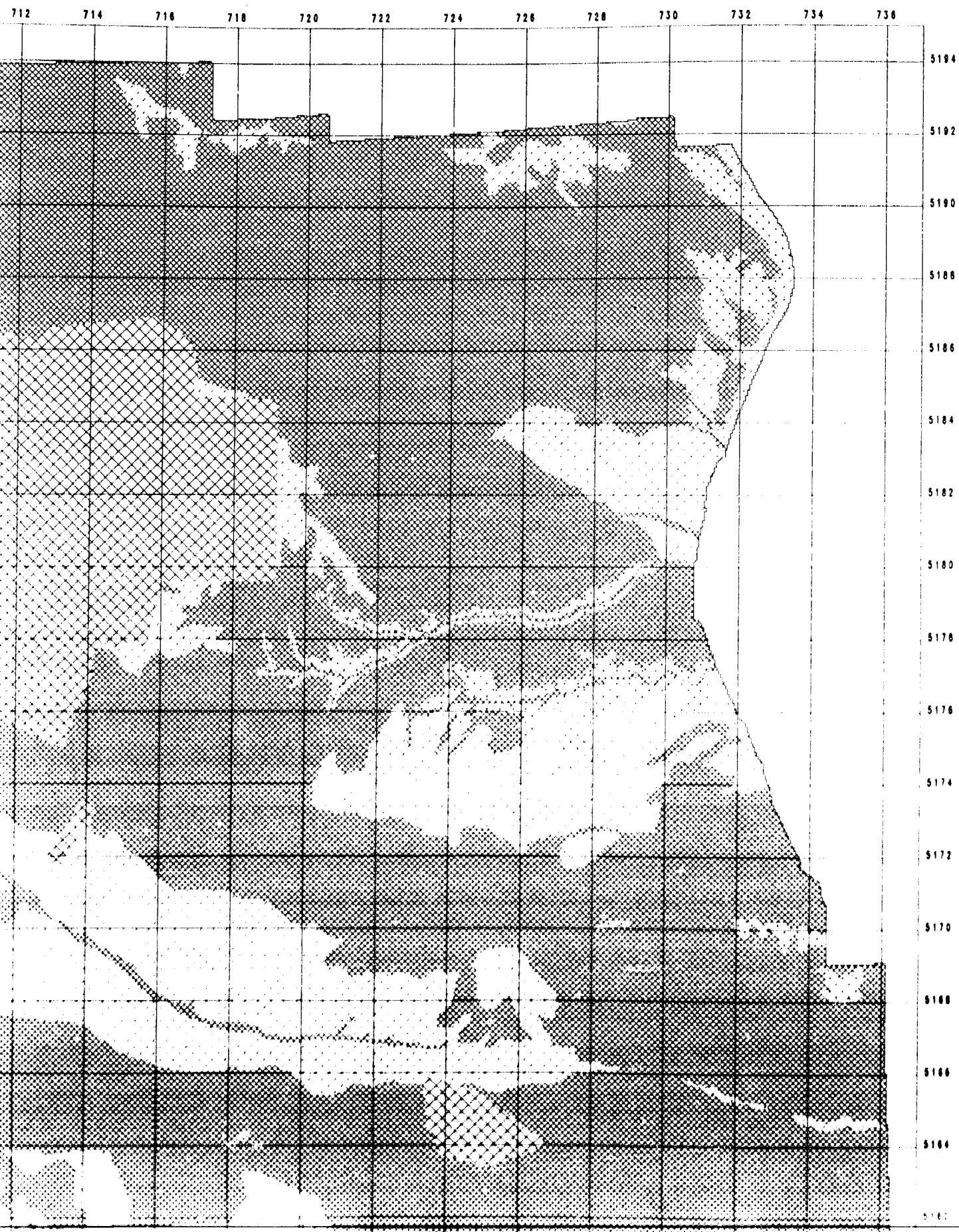


YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

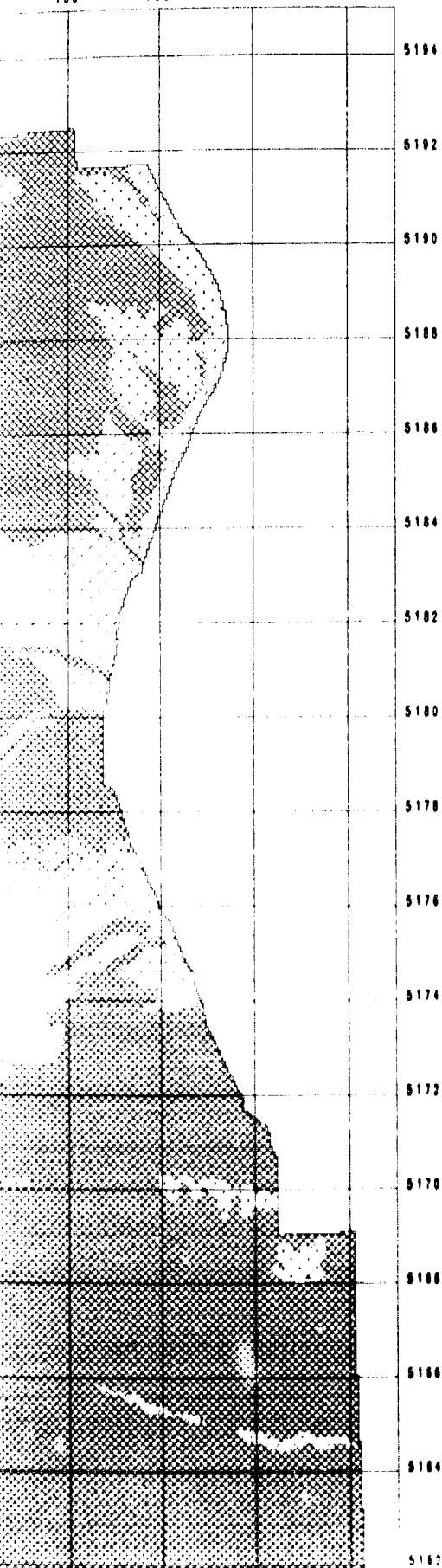


surface condition for one thousand passes



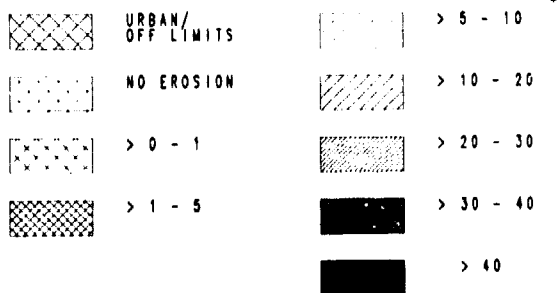


730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES

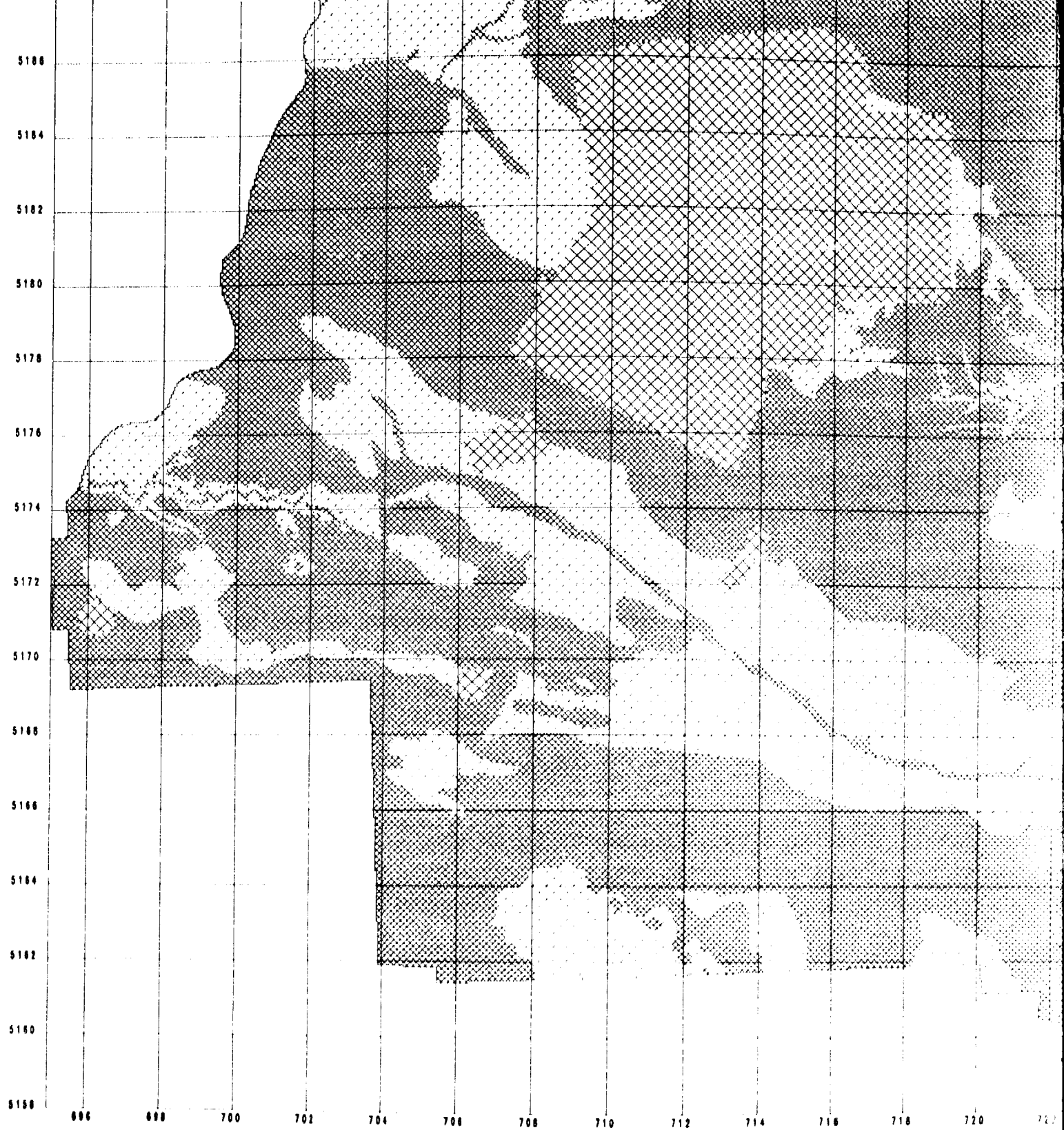
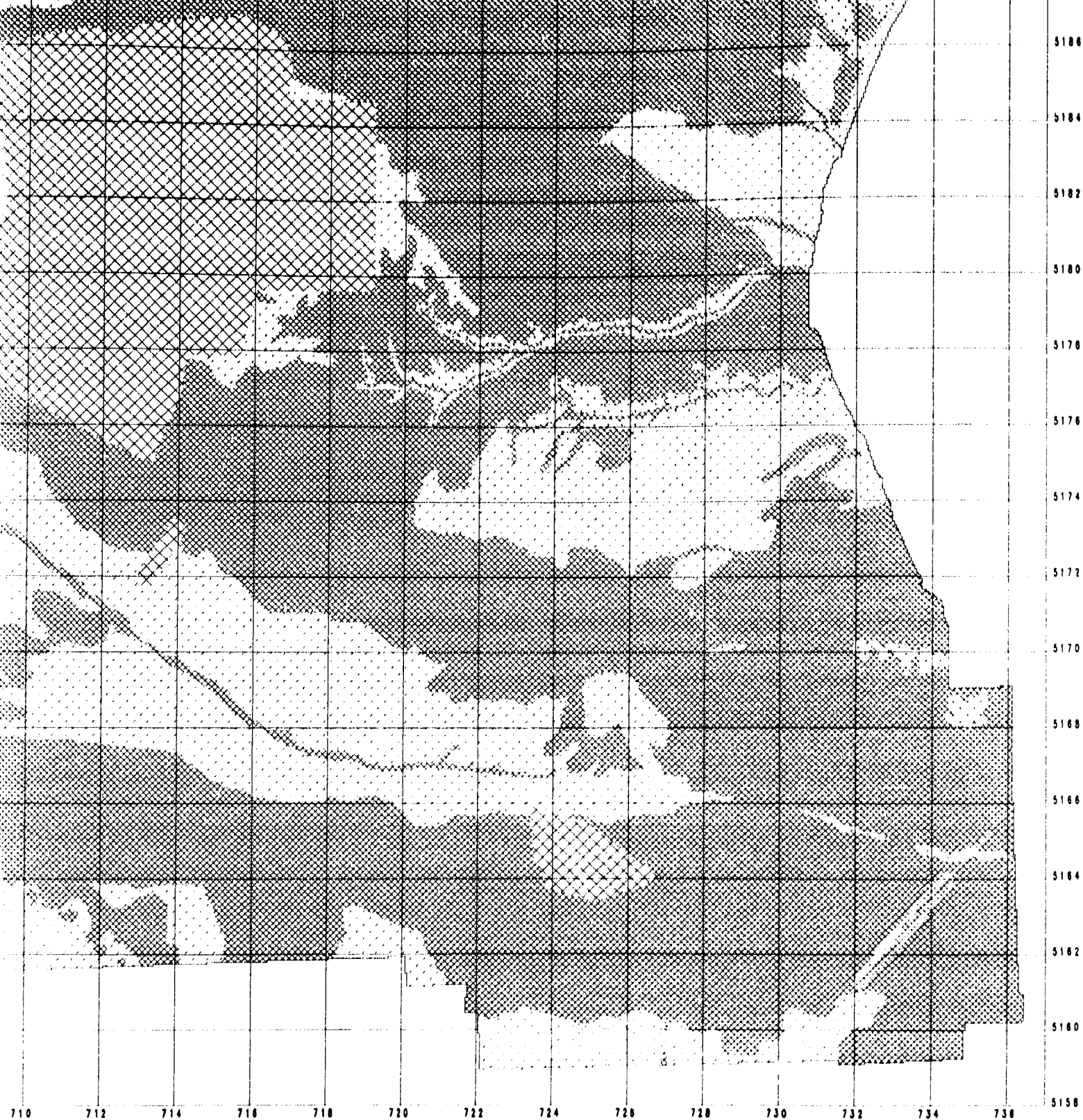
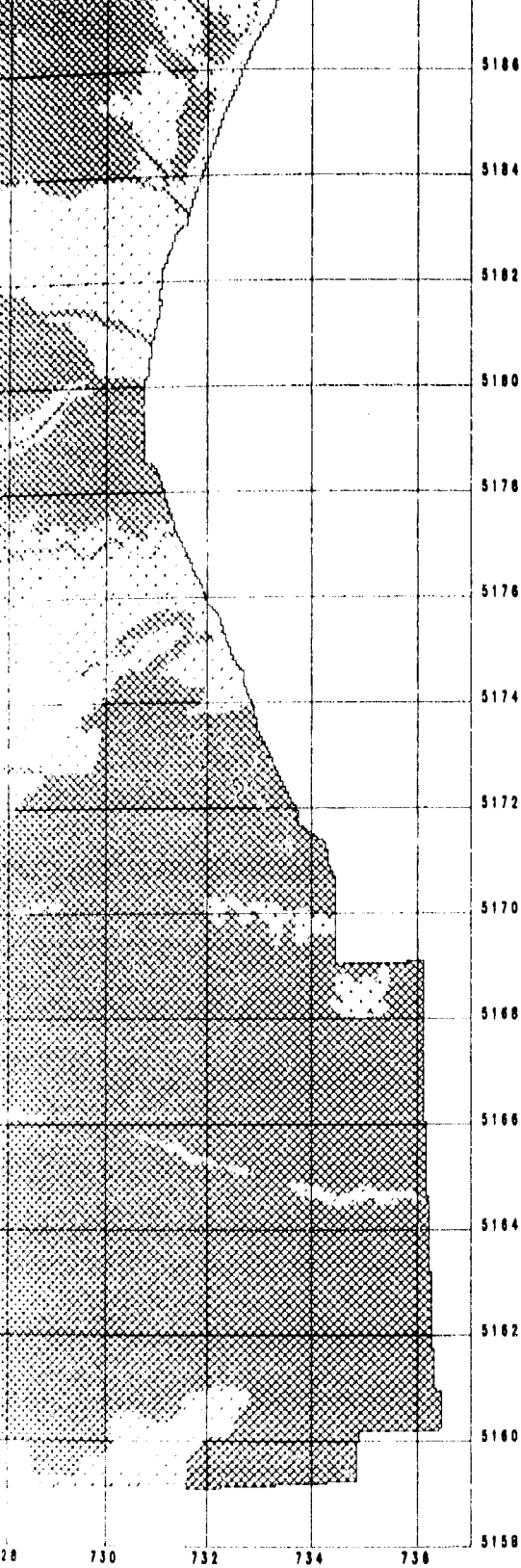


Plate 48. Rate of soil erosion for the 5-5-0 force str



ate 48. Rate of soil erosion for the 5-5-0 force structure in the wet-wet slippery surface condition for ten passes



URBAN/
OFF LIMITS

NO EROSION

> 0 - 1

> 1 - 5

> 5 - 10

> 10 - 20

> 20 - 30

> 30 - 40

> 40

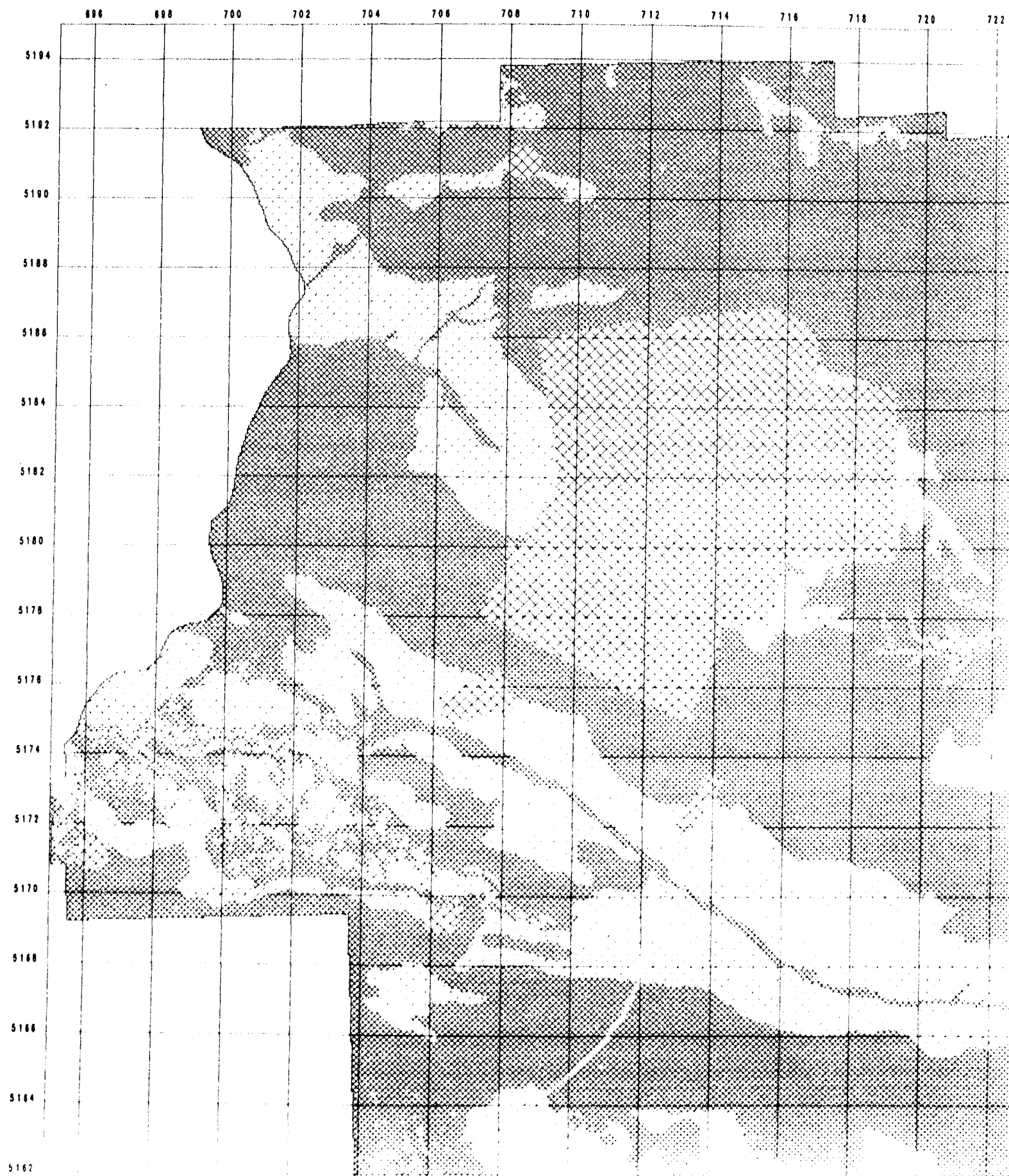
YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
10 PASSES



METERS

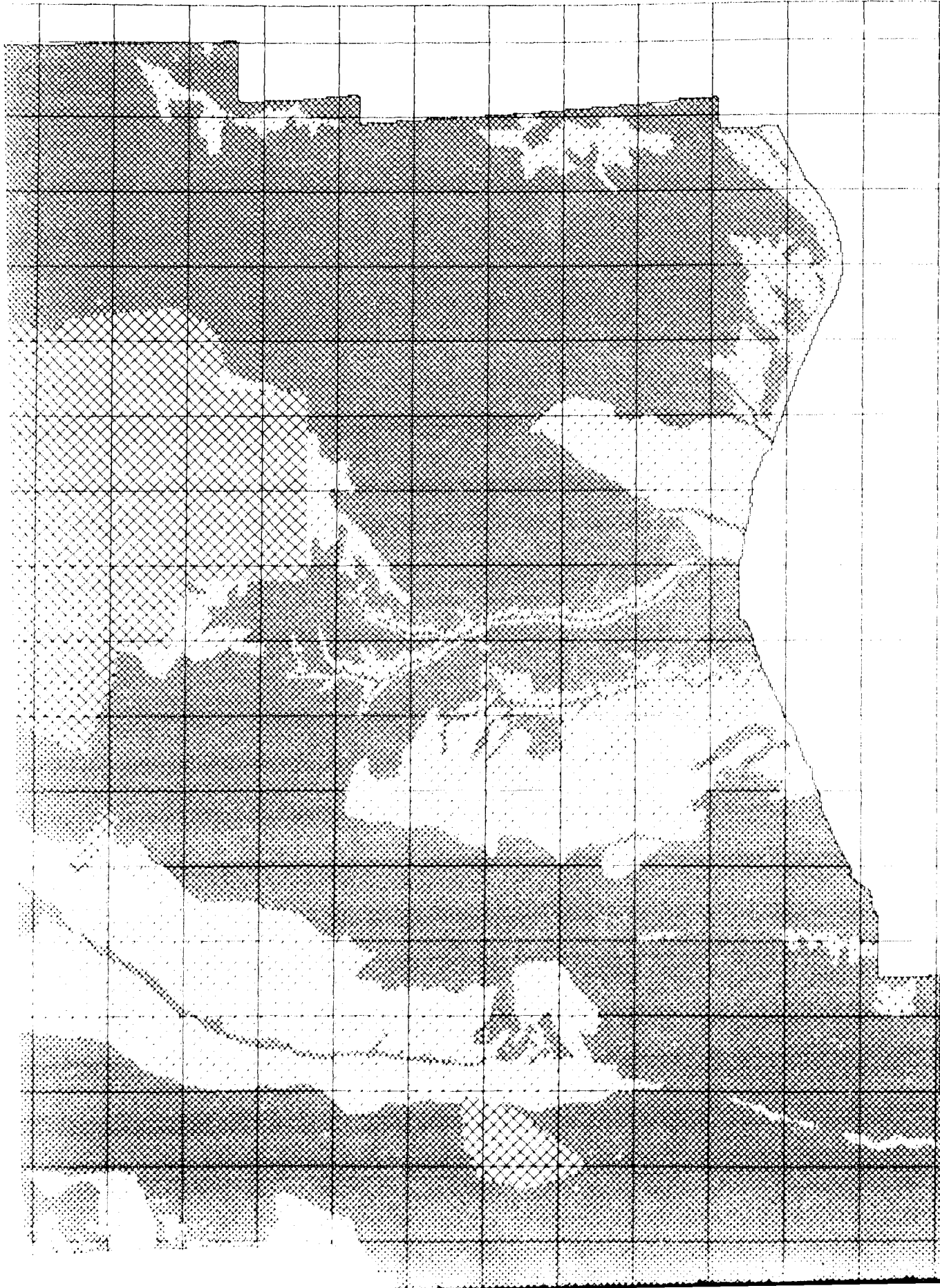
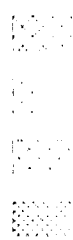
0 2000 4000 6000

slippery surface condition for ten passes

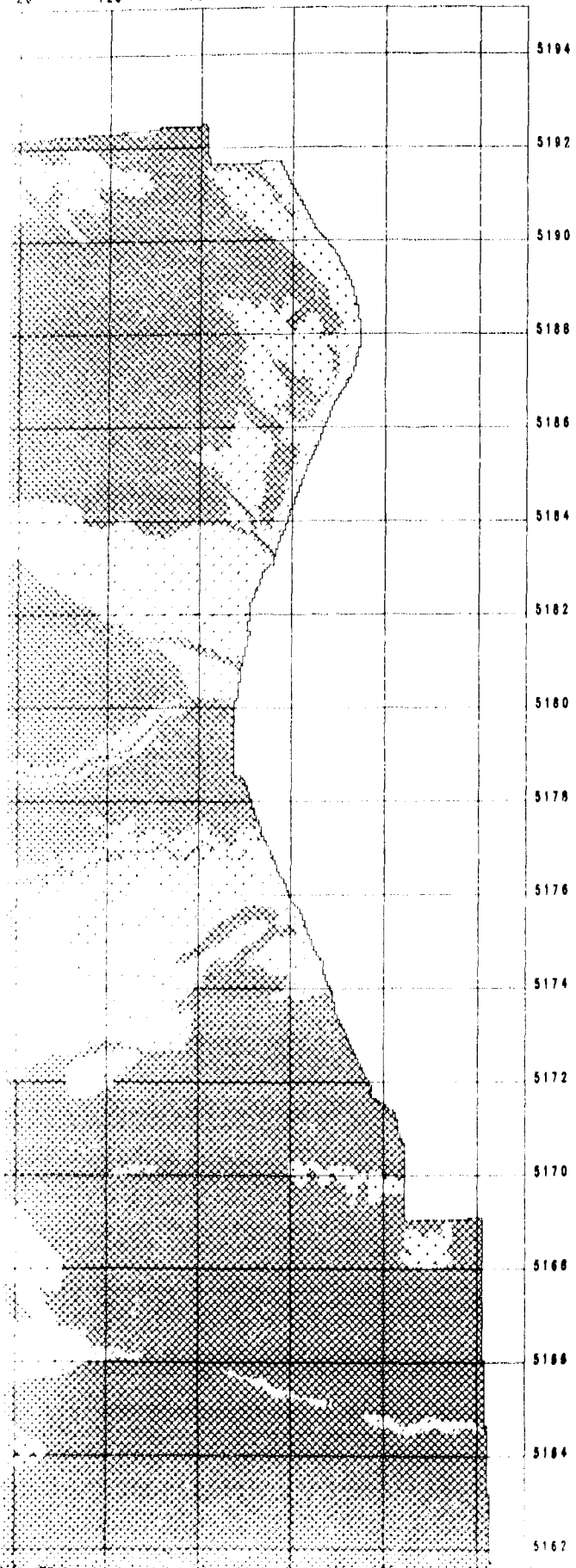


712 714 716 718 720 722 724 726 728 730 732 734 736

5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162



26 728 730 732 734 736



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES

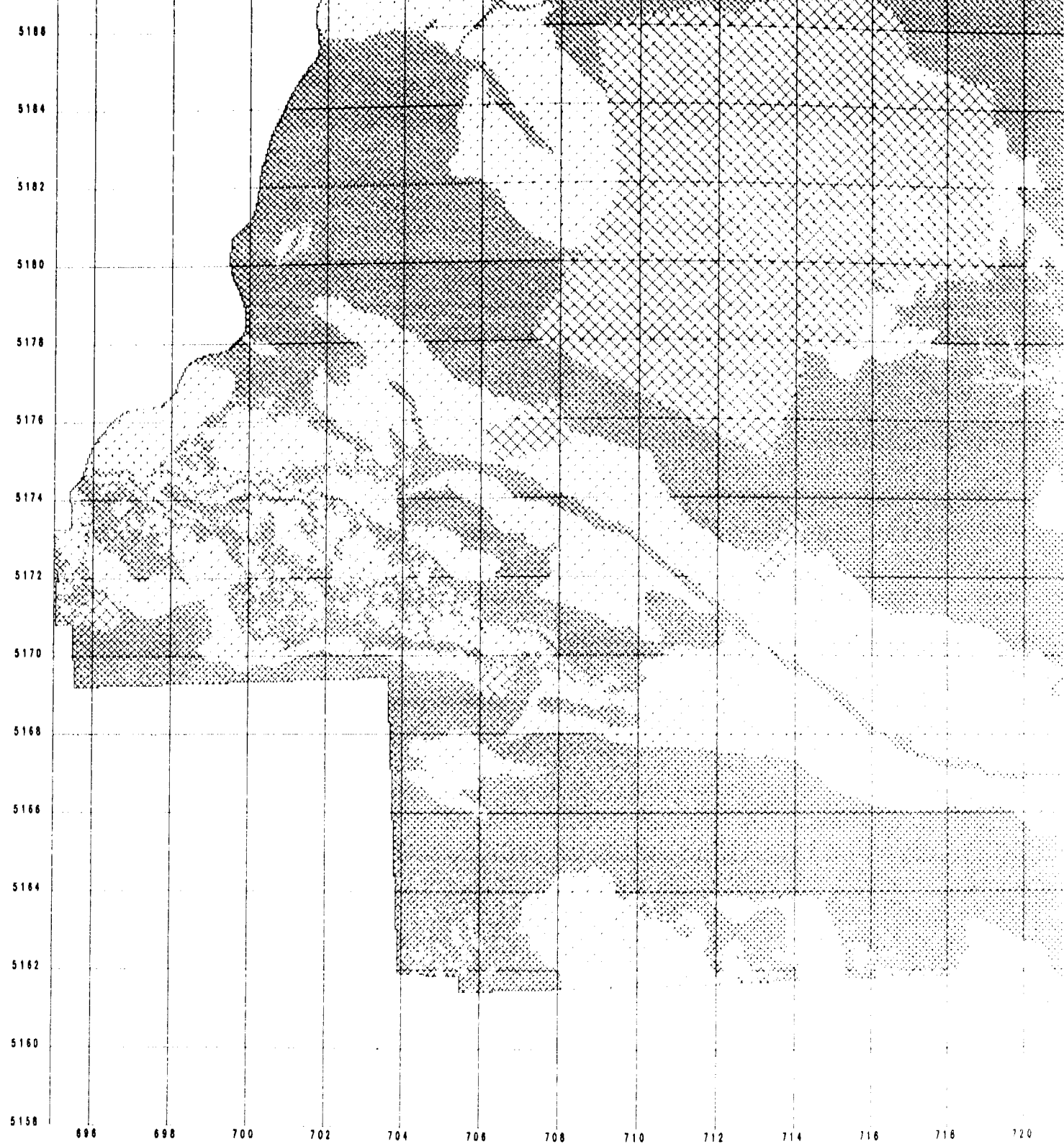


Plate 49. Rate of soil erosion for the 5-5-0 force strength.

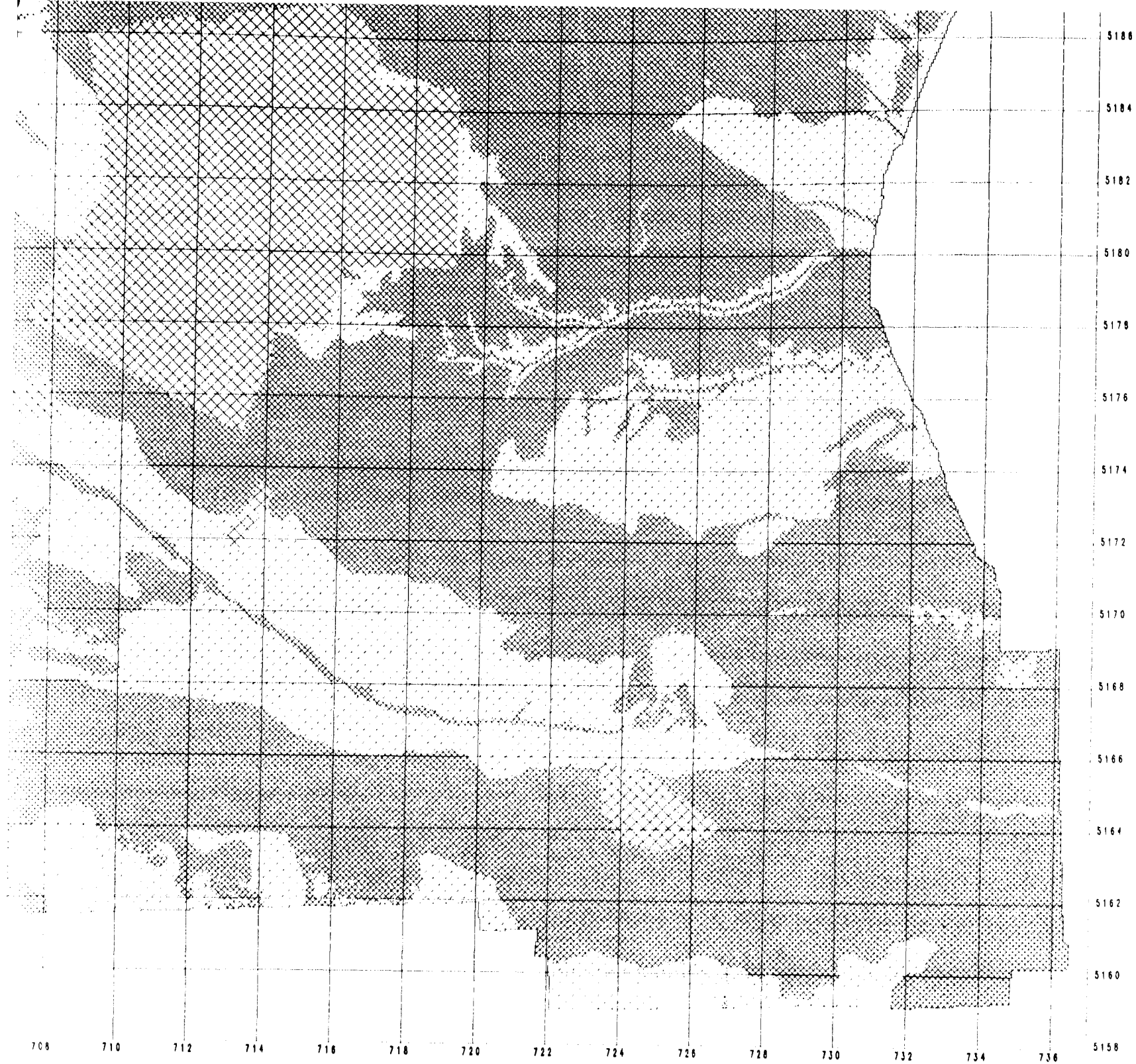
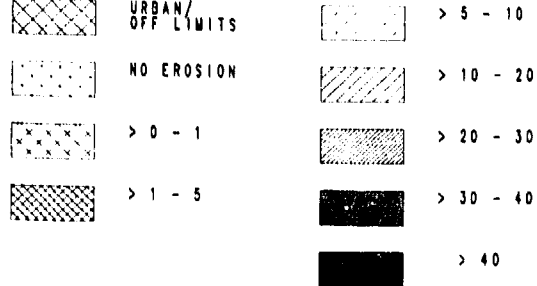
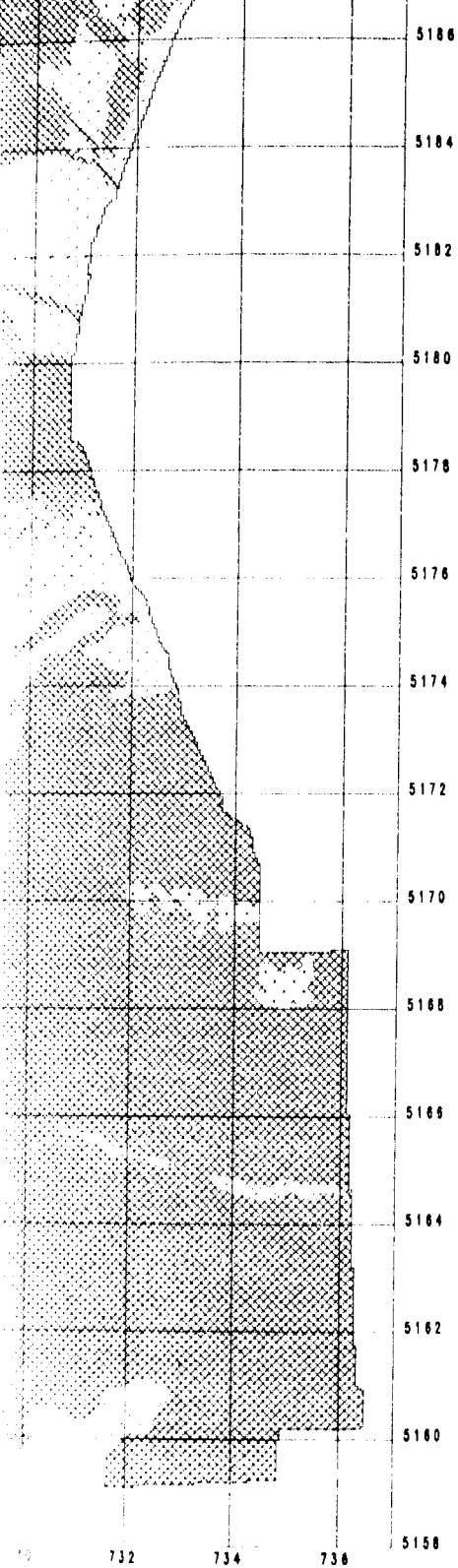
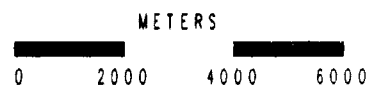


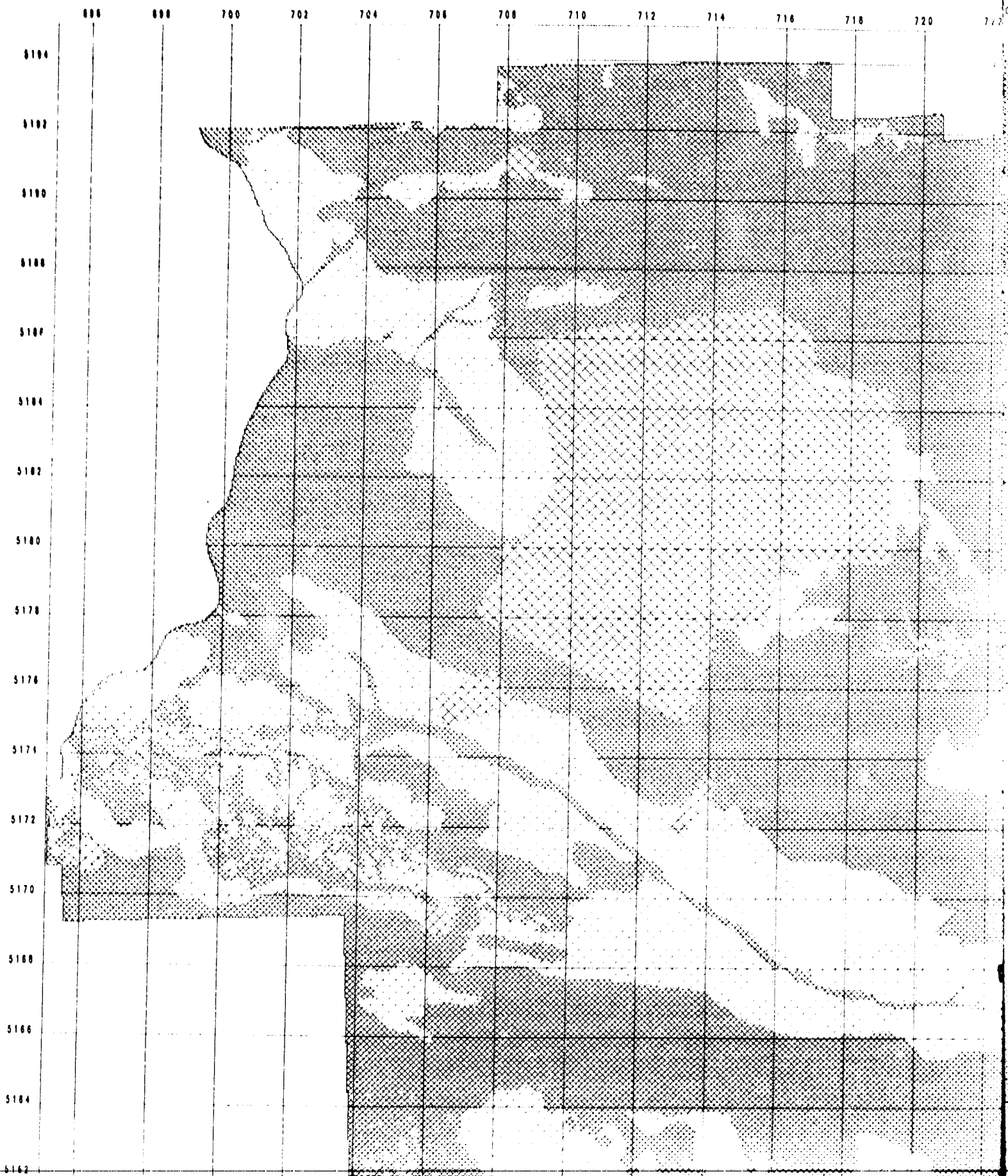
Plate 49. Rate of soil erosion for the 5-5-0 force structure in the wet-wet slippery surface condition for fifty passes



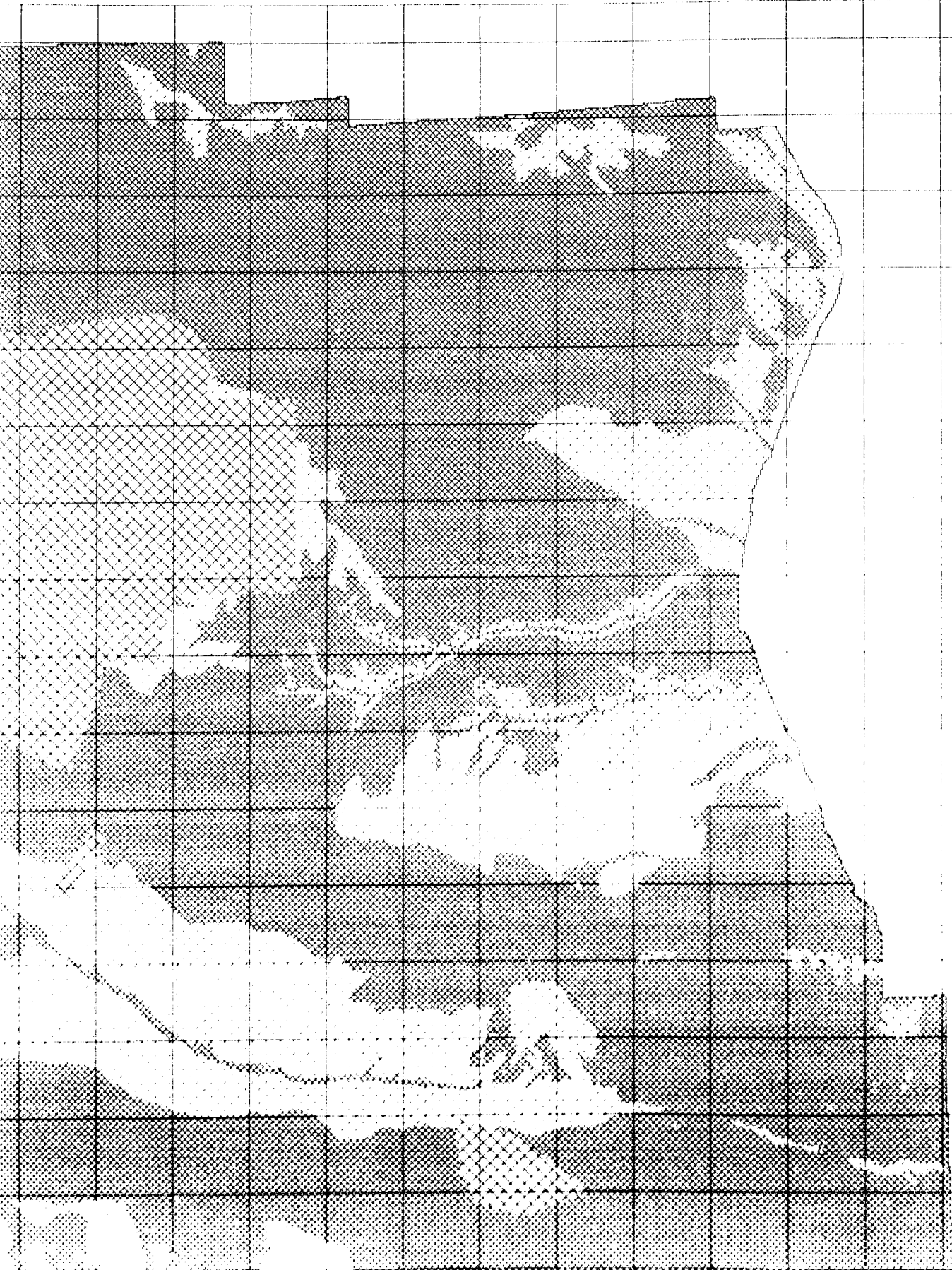
YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
50 PASSES



face condition for fifty passes

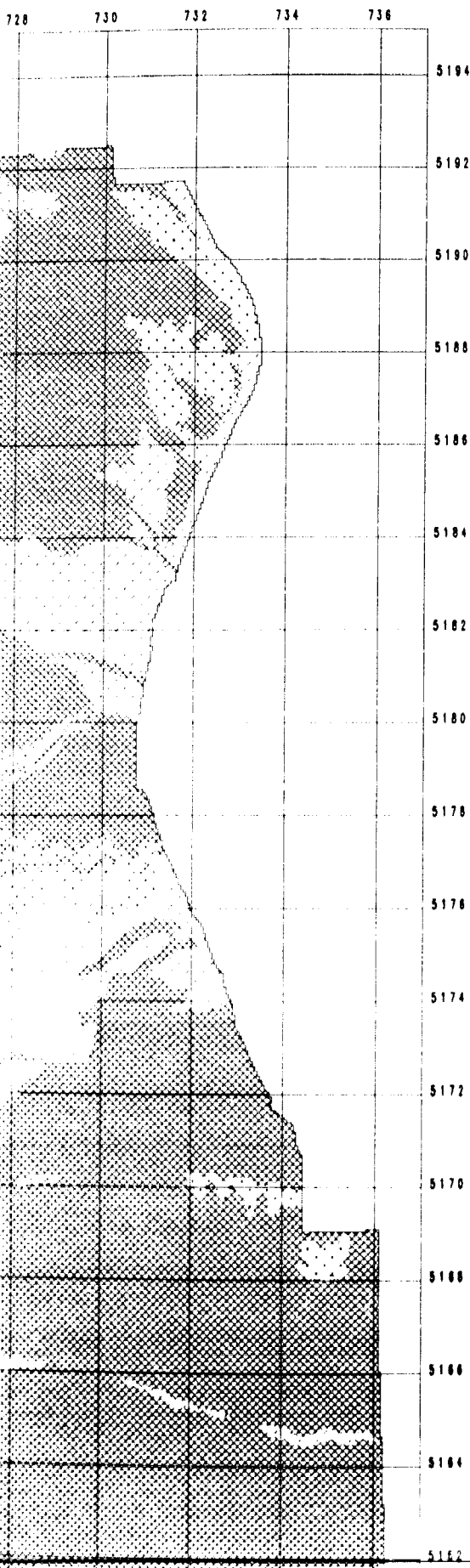


712 714 716 718 720 722 724 726 728 730 732 734 736



5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164

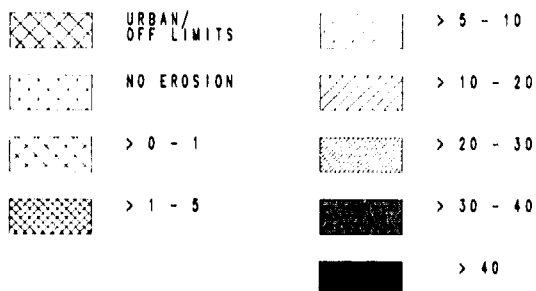




U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)

SCALE 1:100000



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES

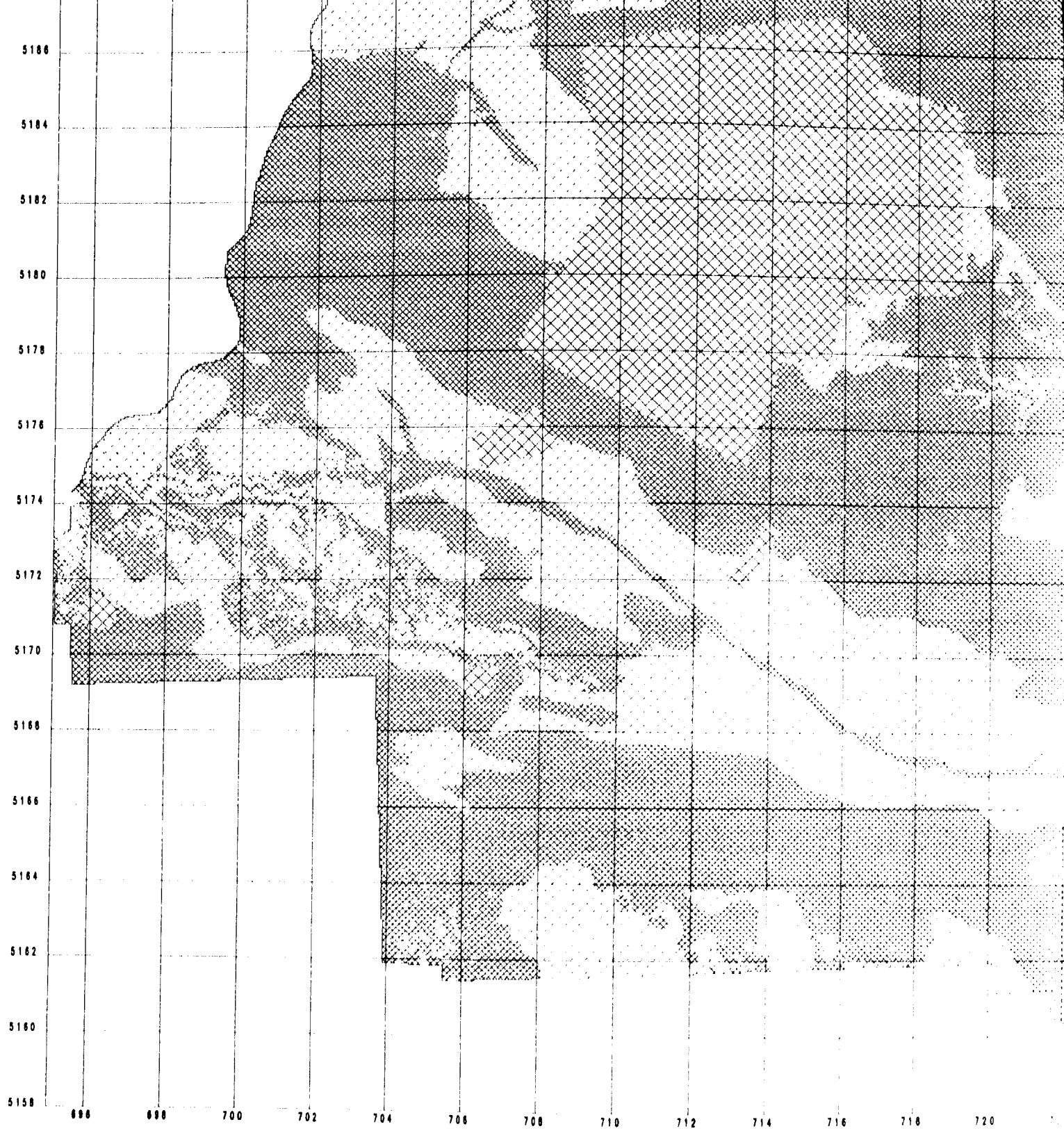
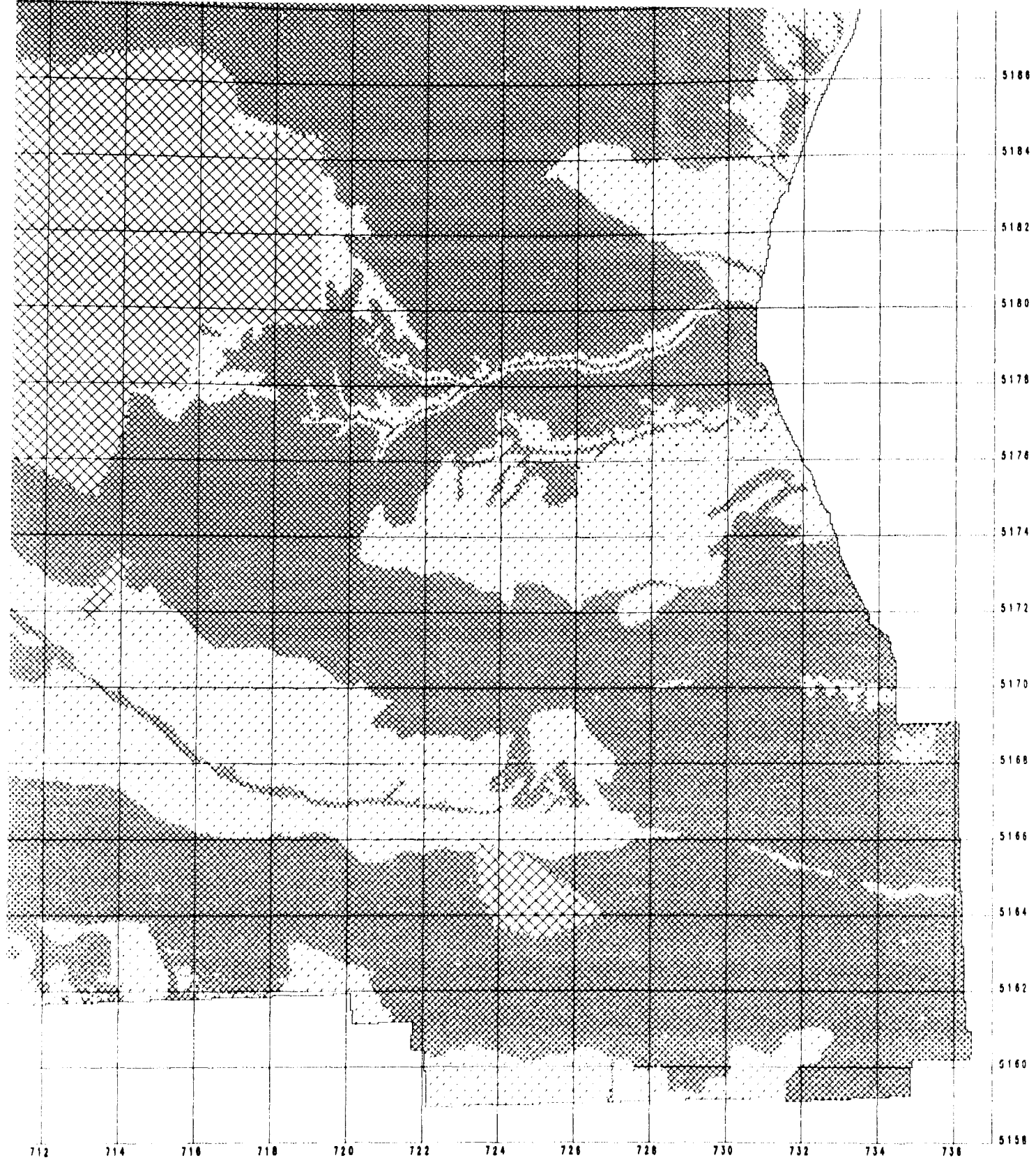
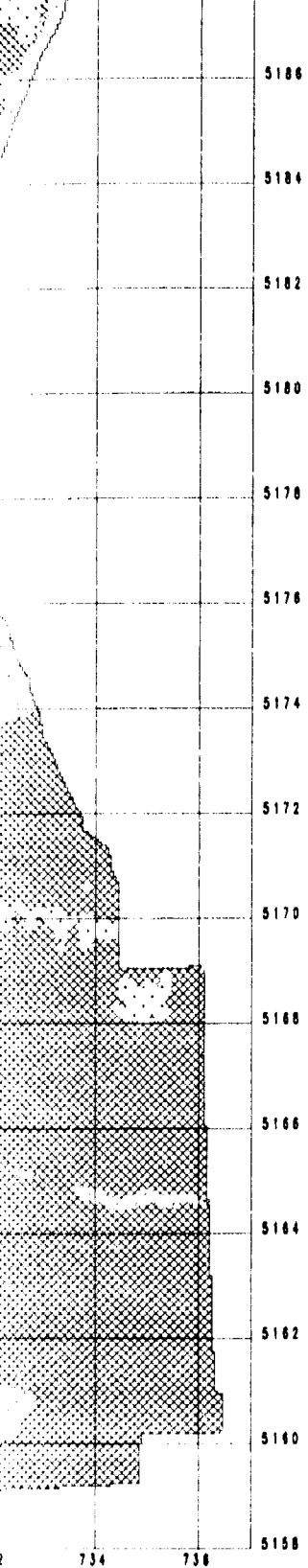


Plate 50. Rate of soil erosion for the 5-5-0 force structure in



soil erosion for the 5-5-0 force structure in the wet-wet slippery surface condition for one thousand passes



URBAN/
OFF LIMITS

NO EROSION

> 0 - 1

> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30

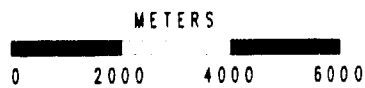


> 30 - 40

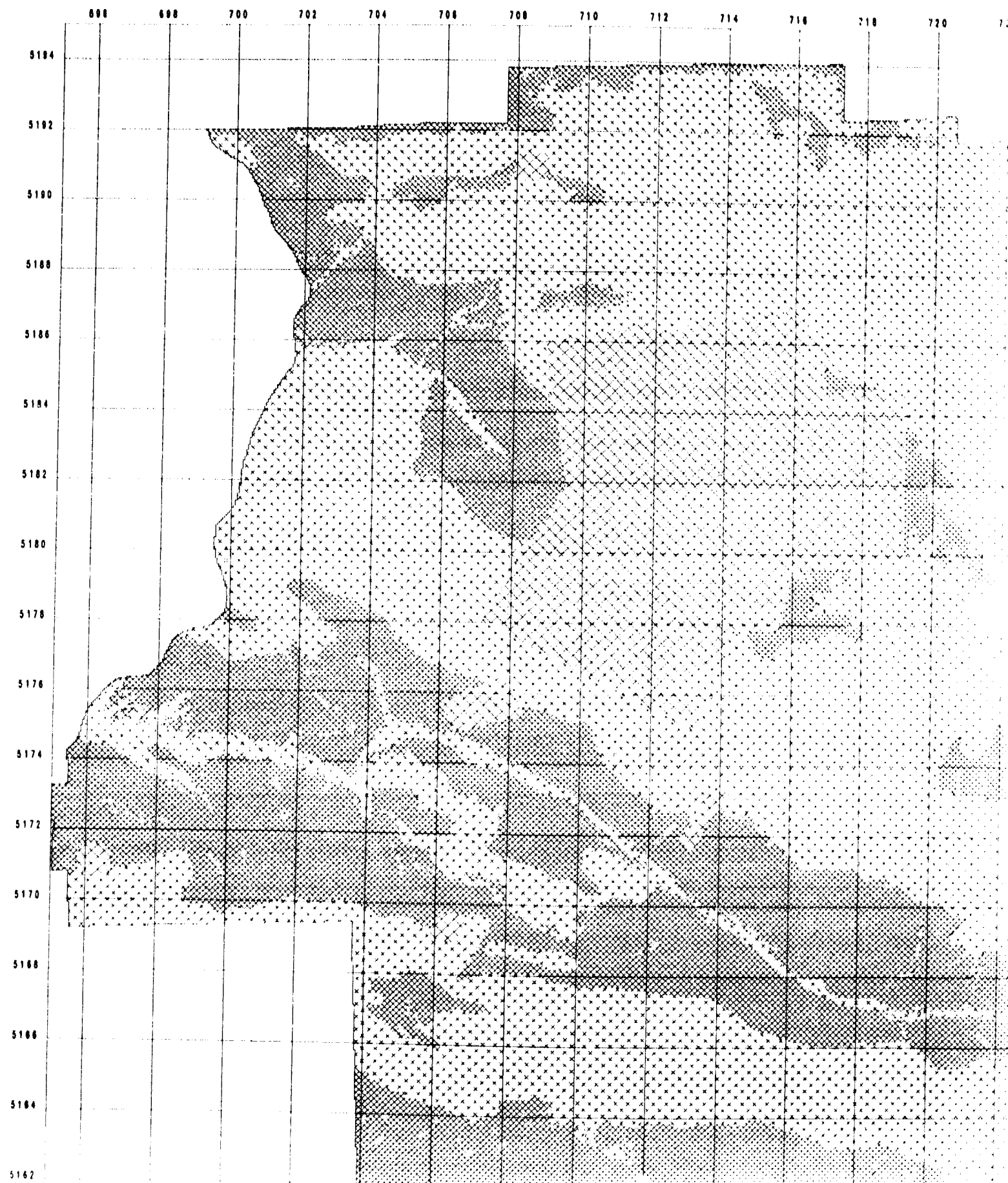


> 40

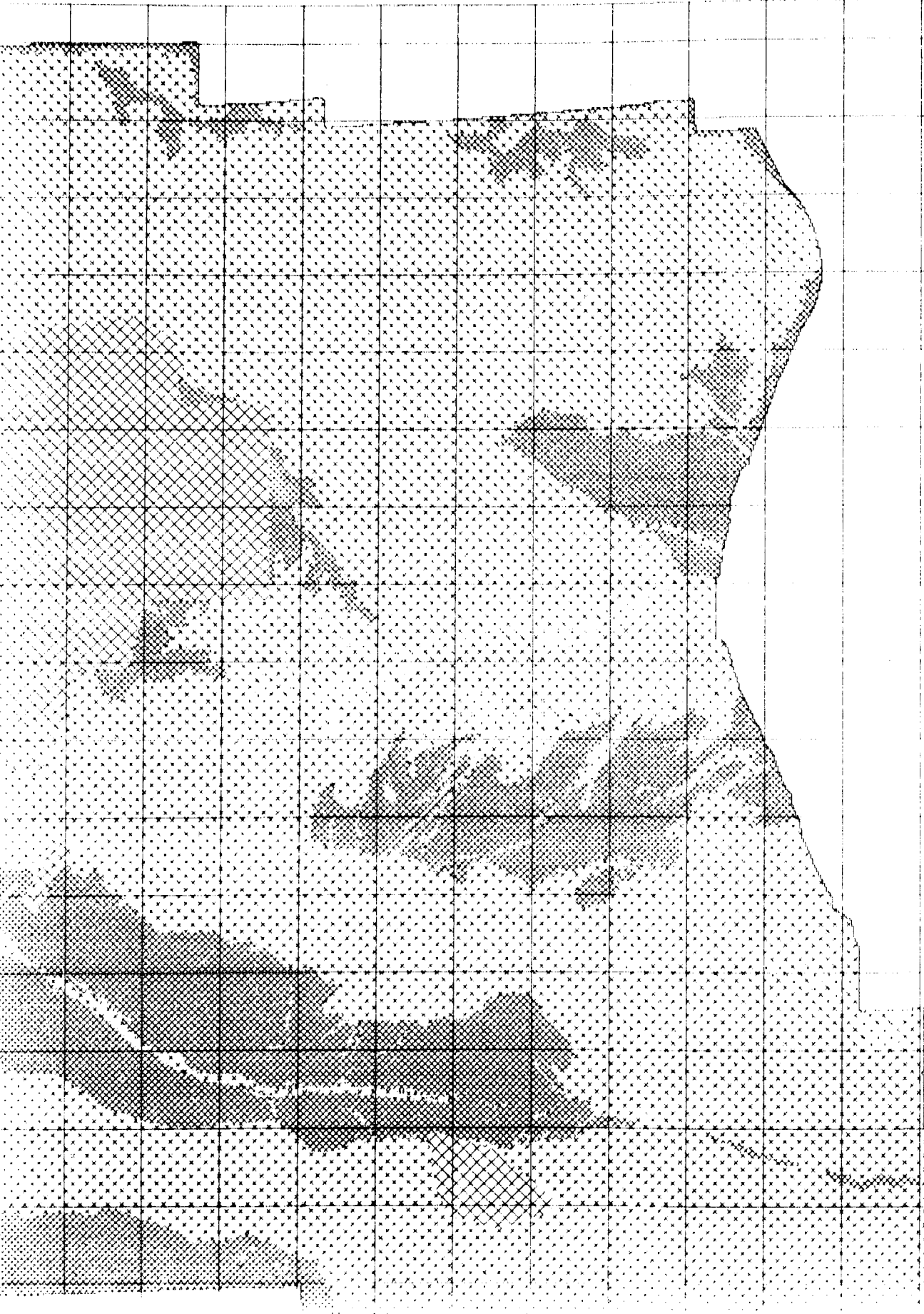
YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
WET-WET SEASON
SLIPPERY CONDITION
1000 PASSES



for one thousand passes



714 716 718 720 722 724 726 728 730 732 734 735



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



TOTAL POSSIBLE



728 730 732 734 736

5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164
5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
10 PASSES



METERS

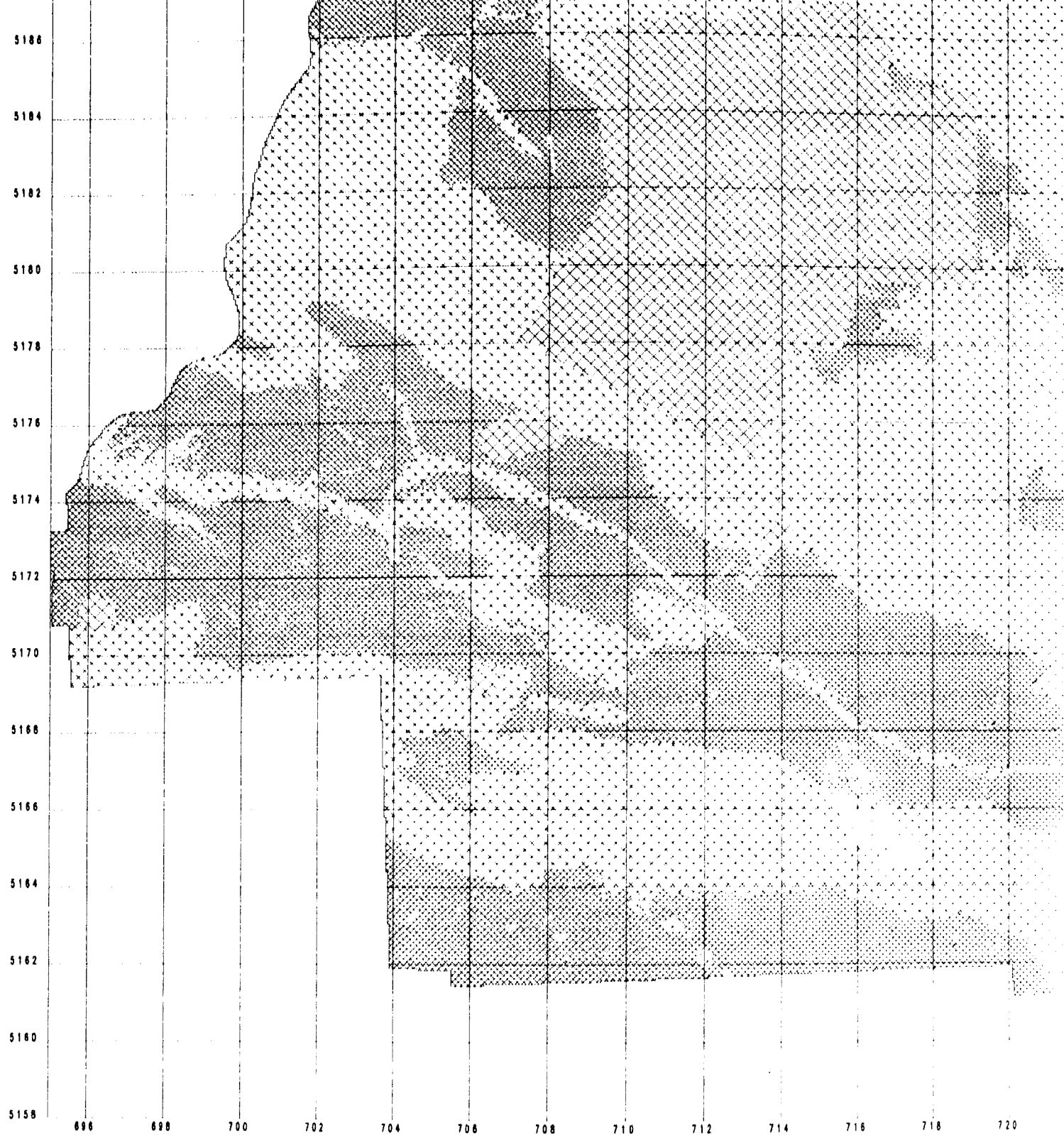


Plate 51. Soil erosion severity for 3-3-3

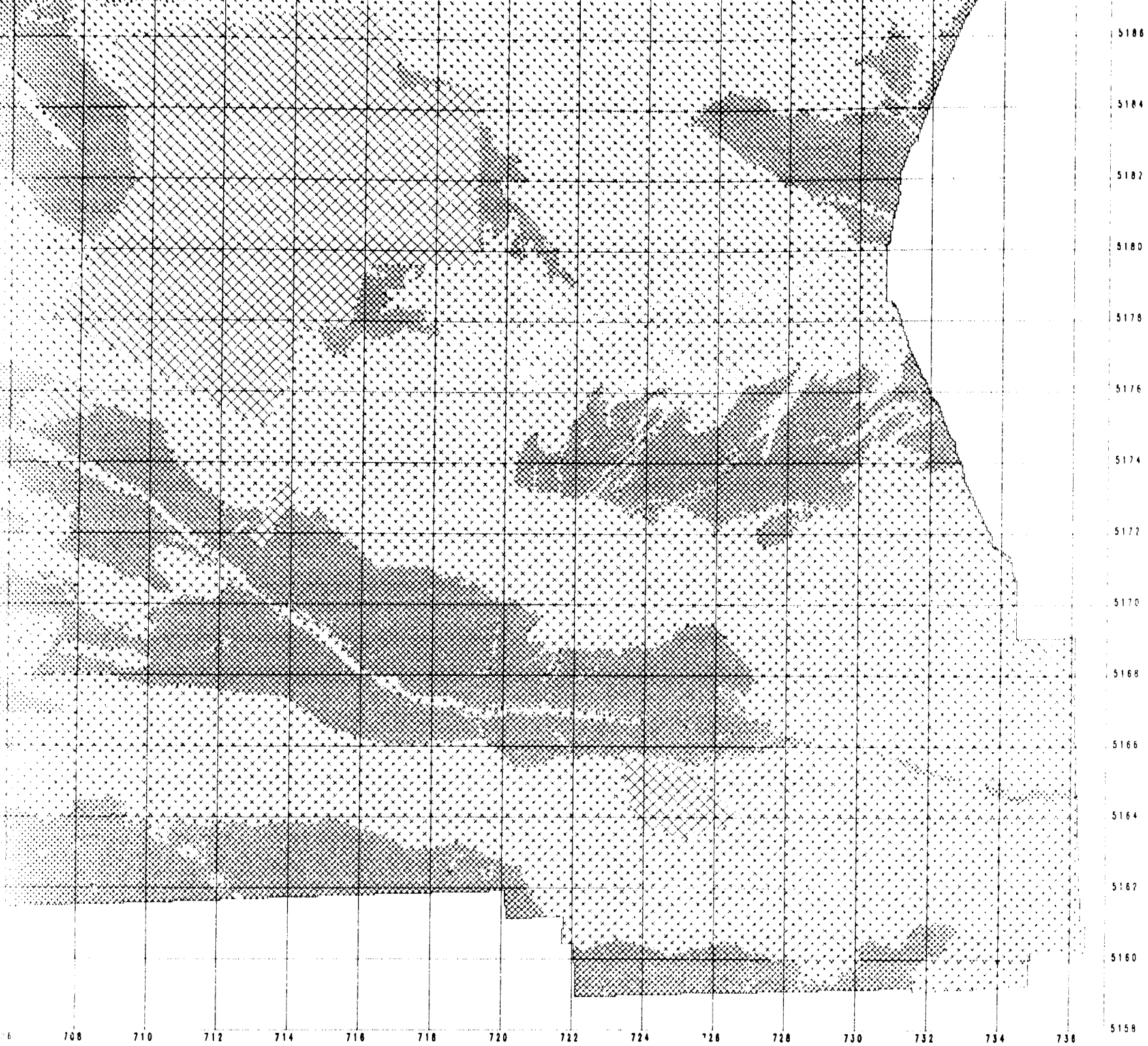
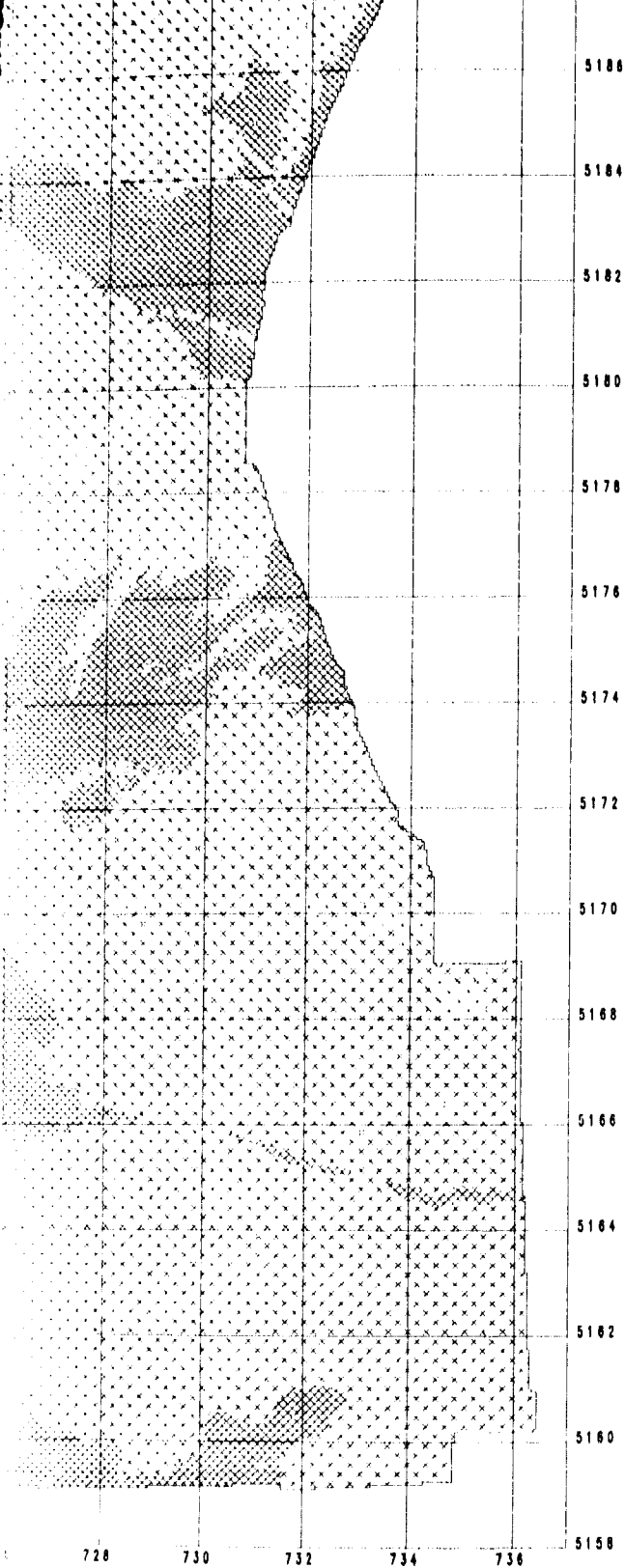


Plate 51. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for ten passes



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



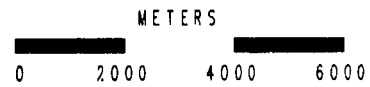
> 30 - 40



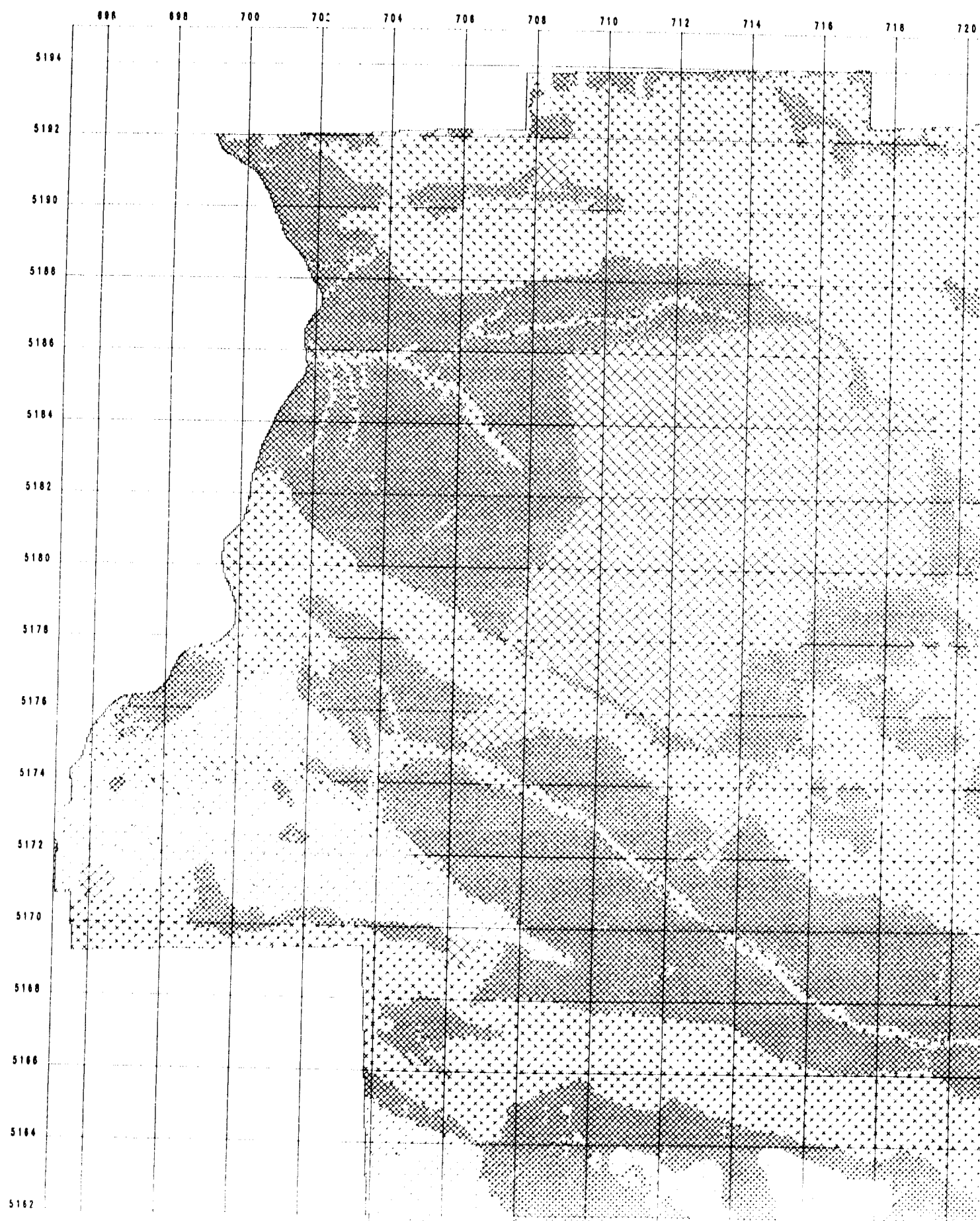
> 40

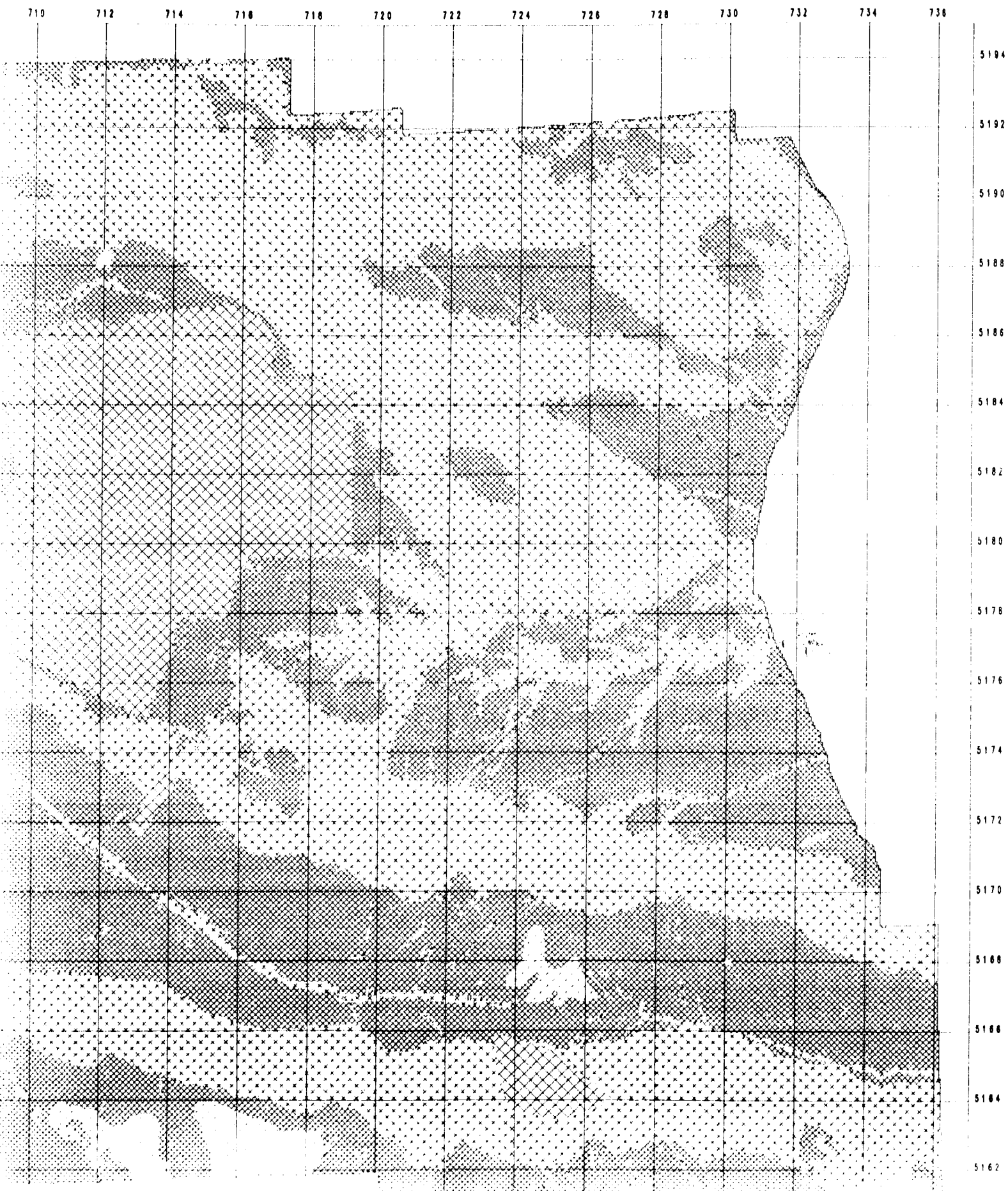
YAKIMA FIRING CENTER

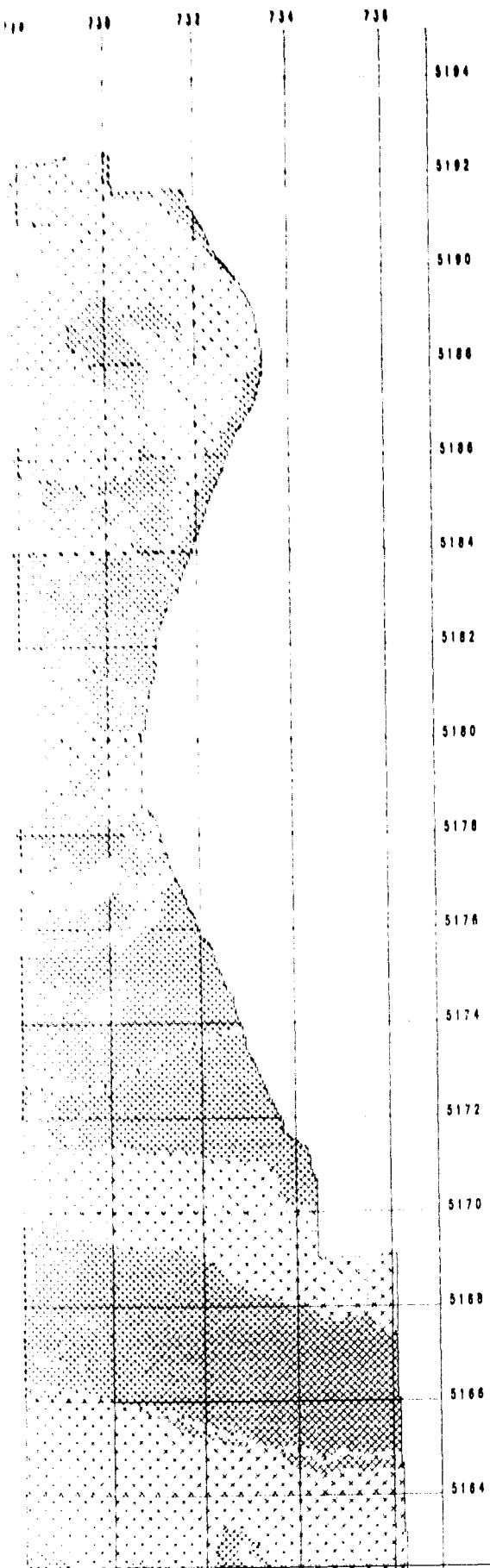
3-3-5 FORCE STRUCTURE
10 PASSES



Force structures for ten passes
















U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
50 PASSES

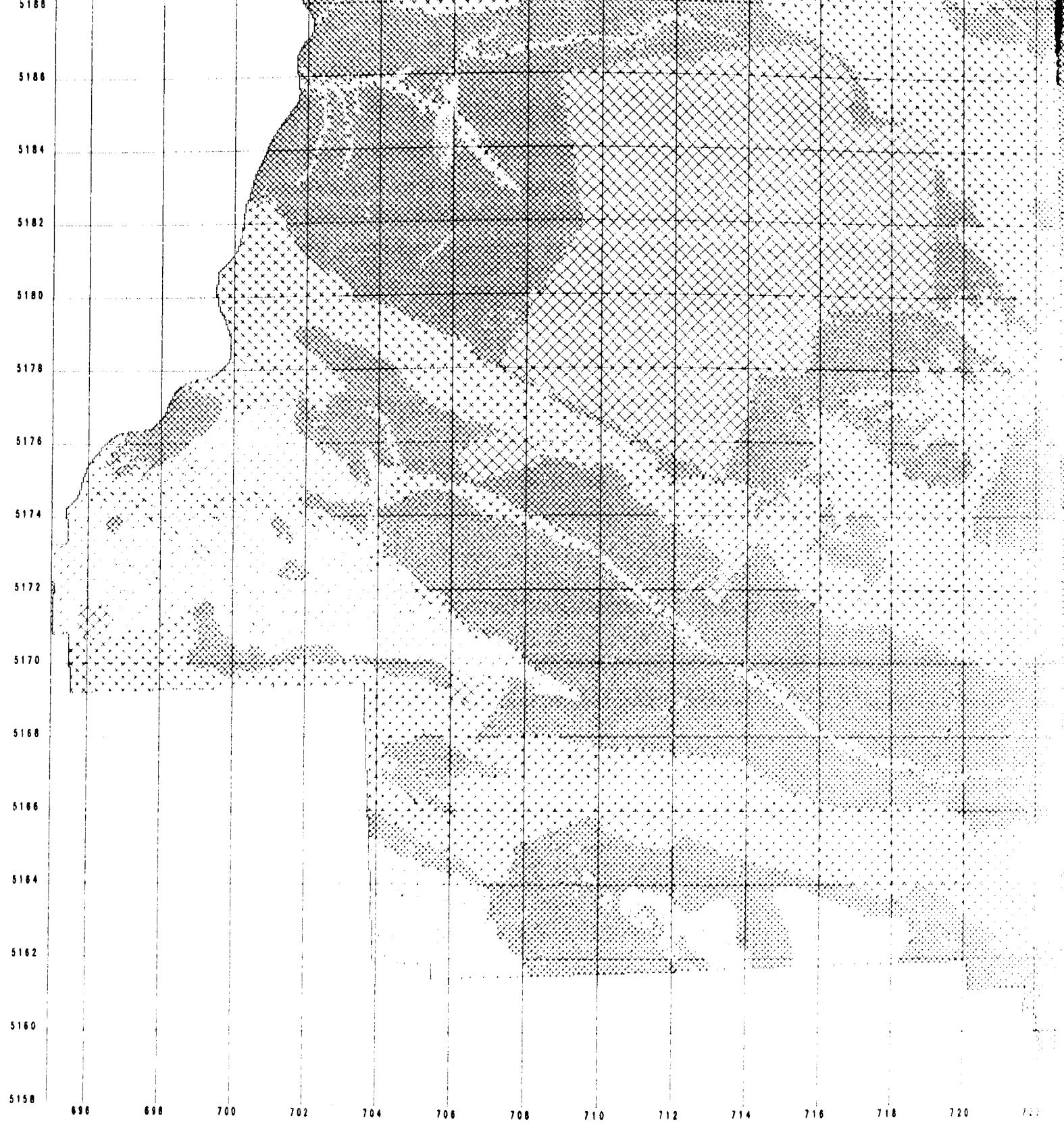


Plate 52. Soil erosion severity for 3-3-5

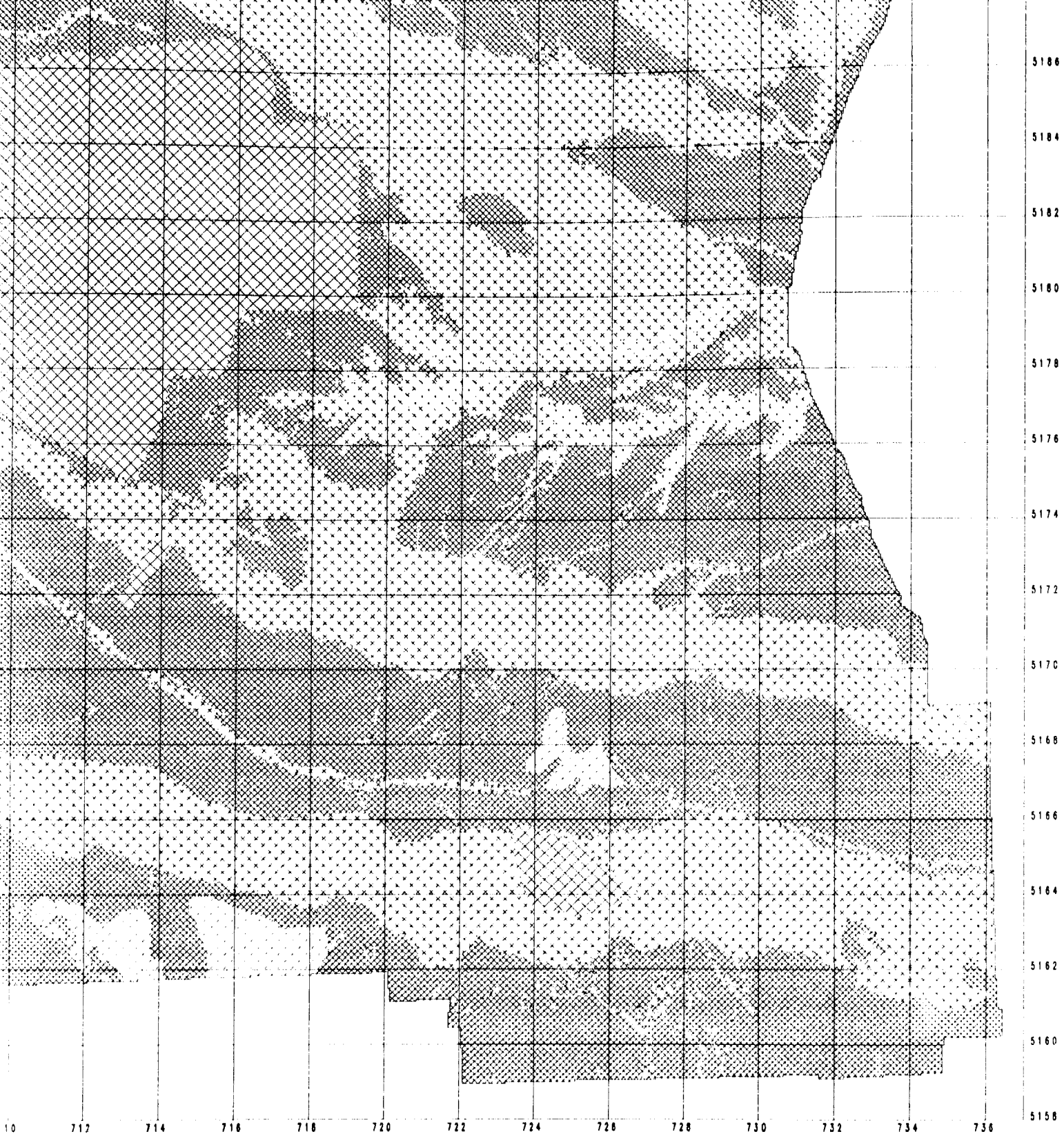
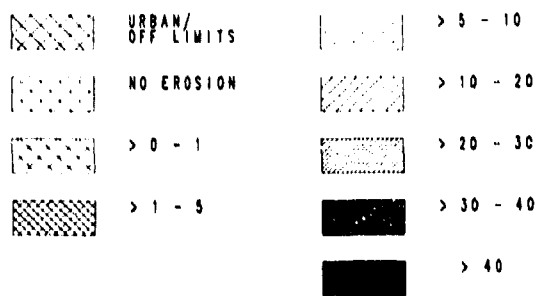
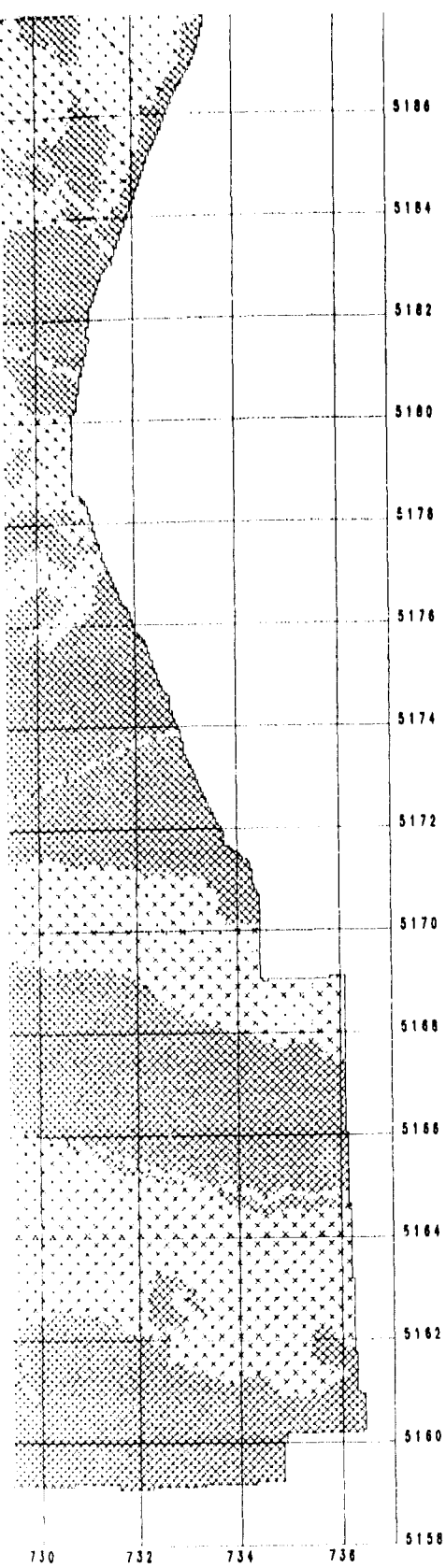
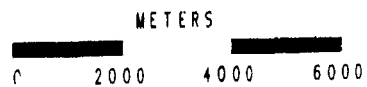


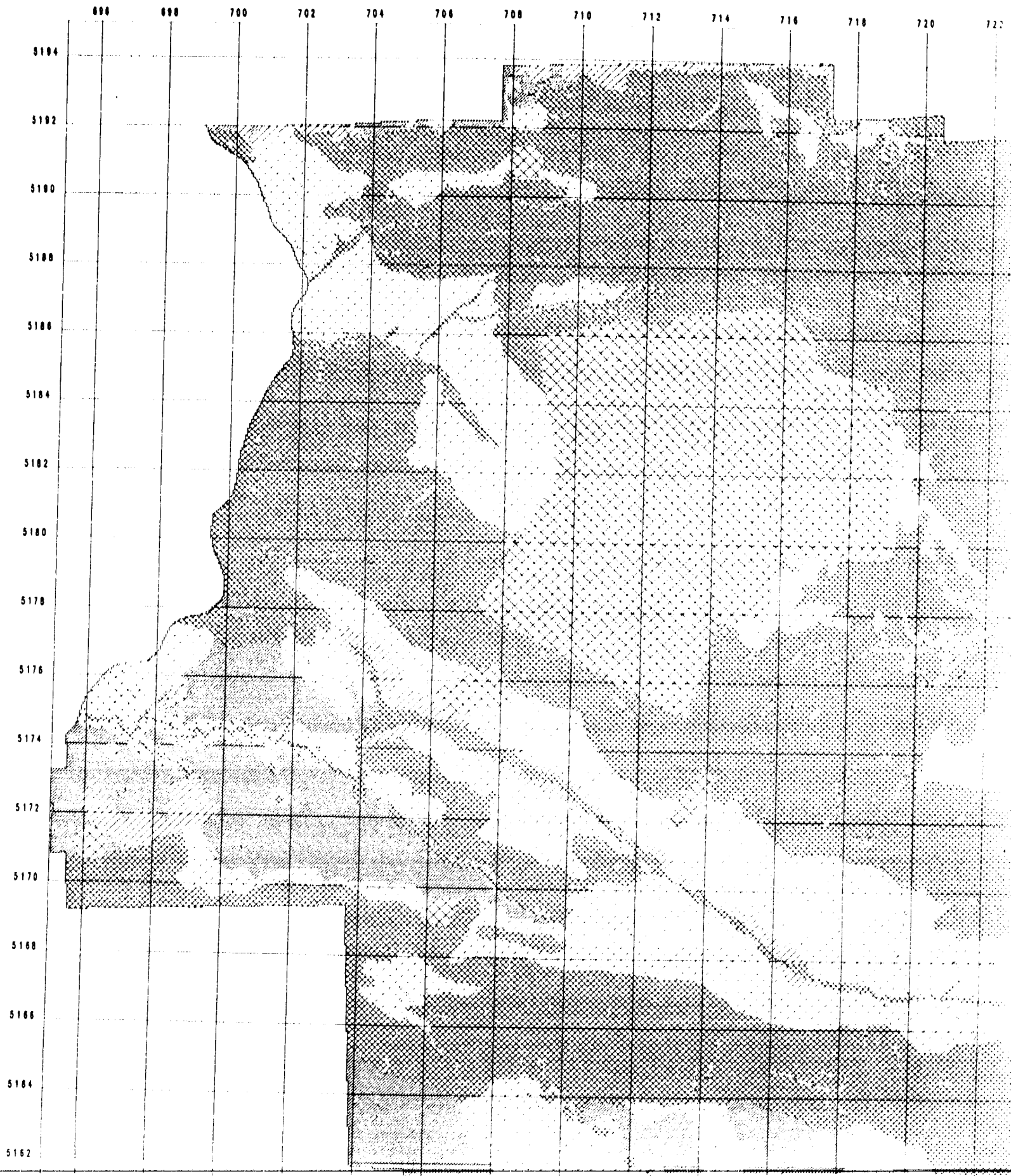
Plate 52. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for fifty passes

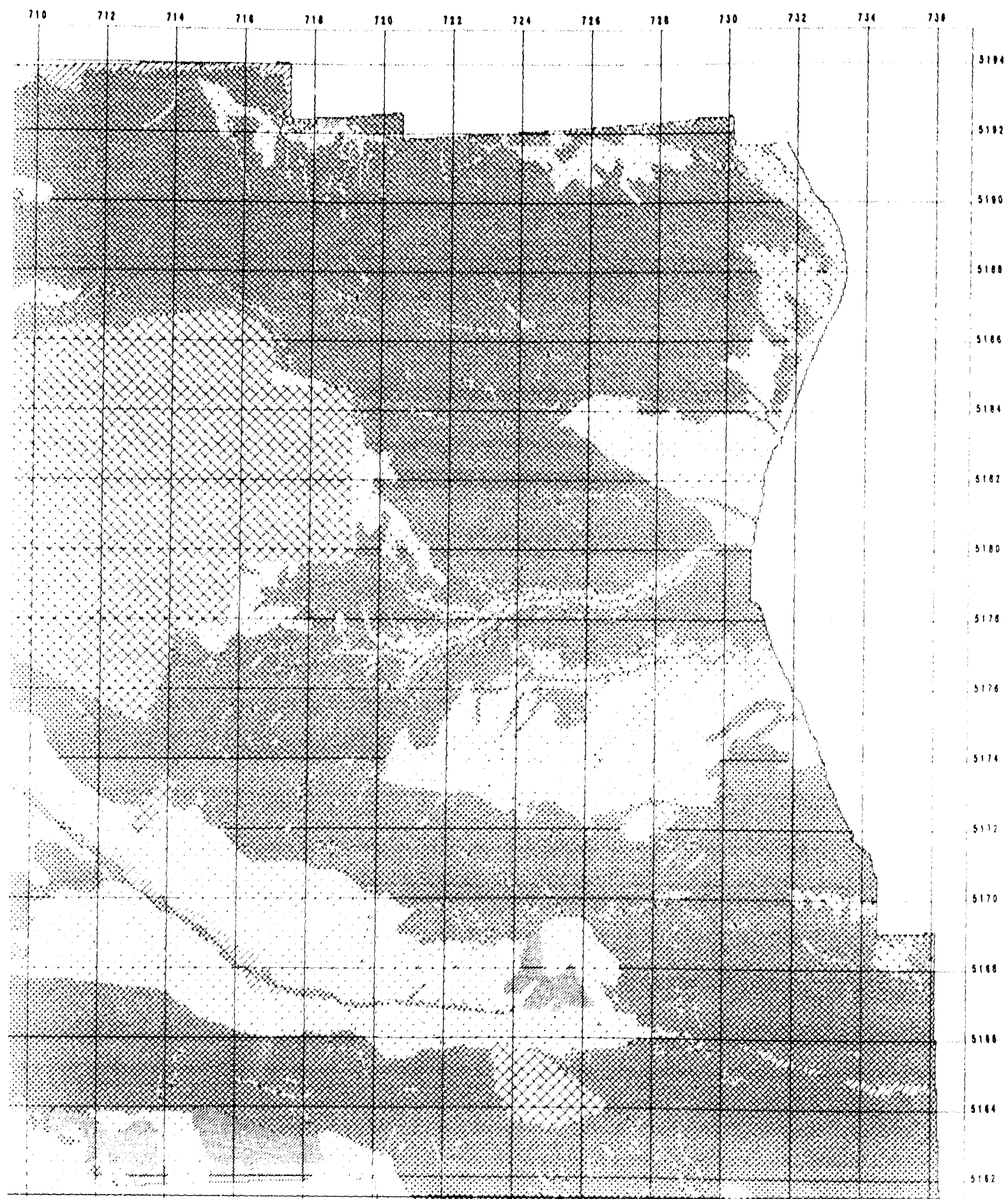


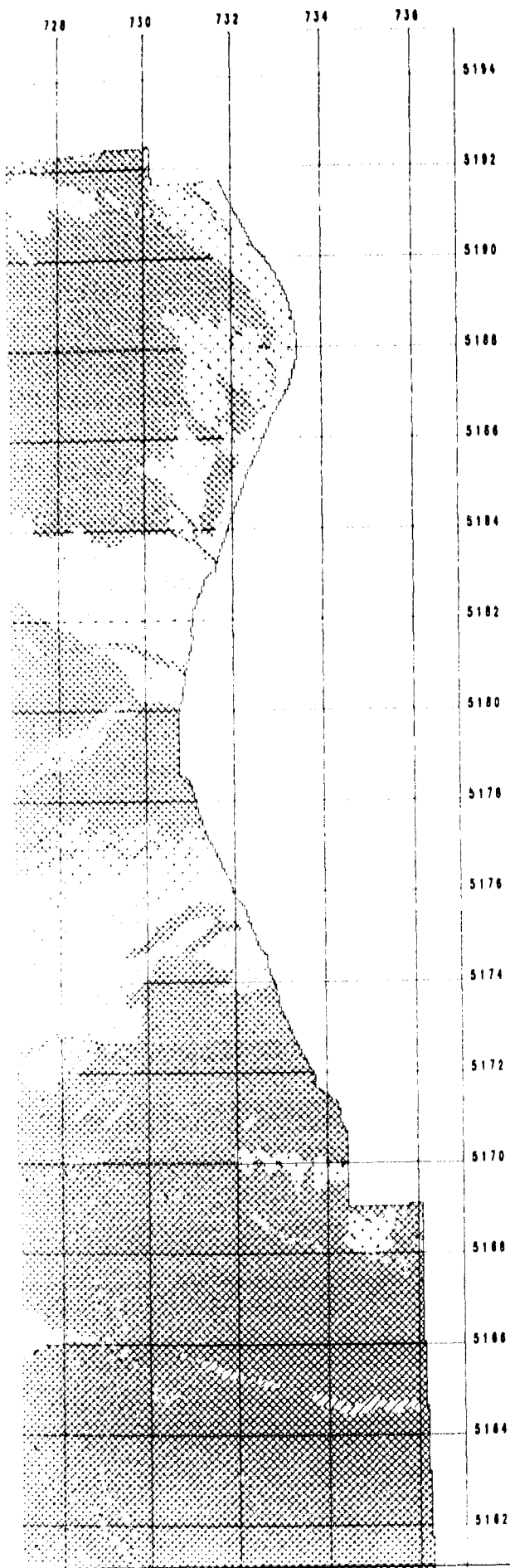
YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
50 PASSES



structures for fifty passes
















U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
3-3-5 FORCE STRUCTURE
1000 PASSES



METERS

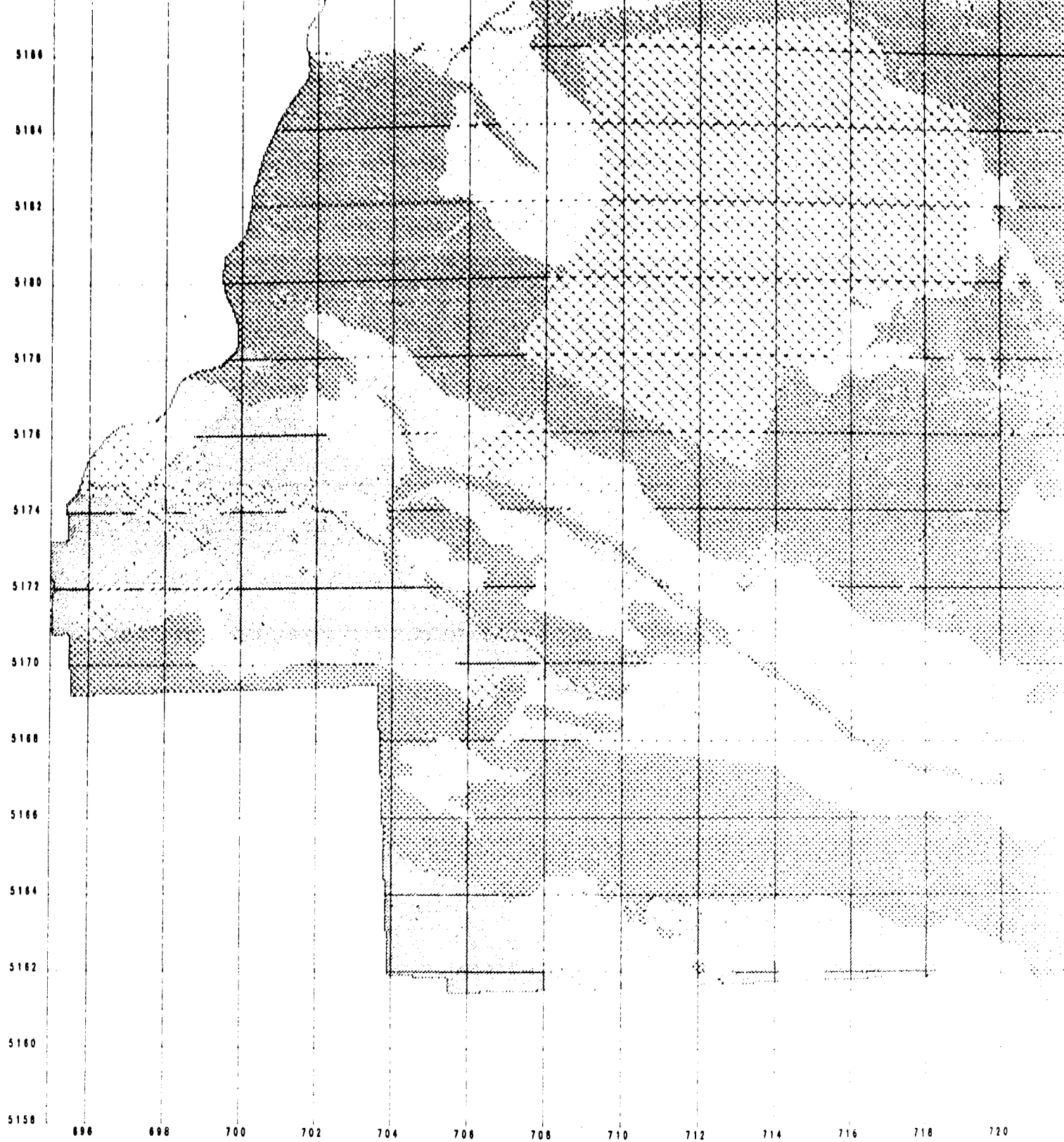
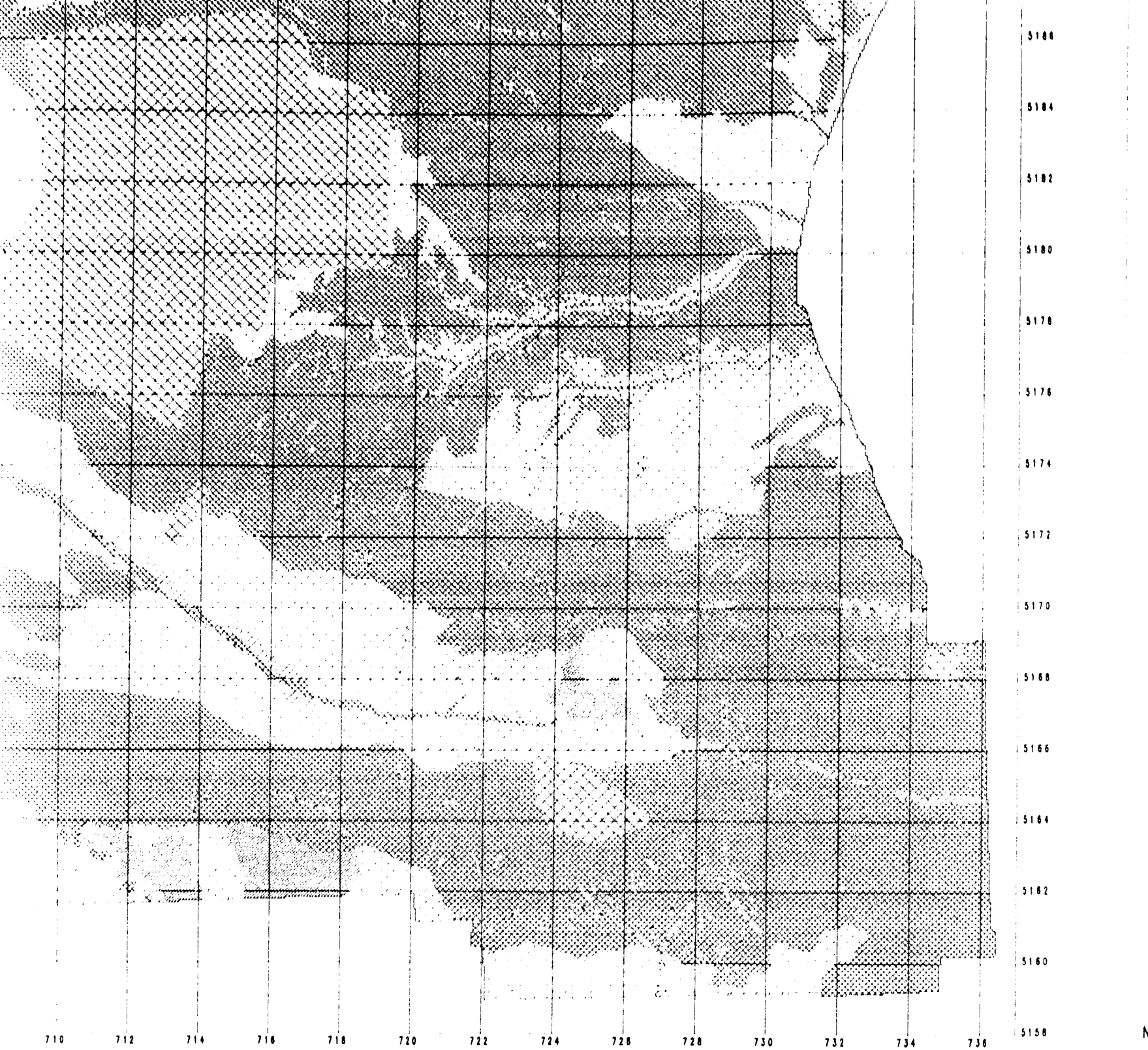
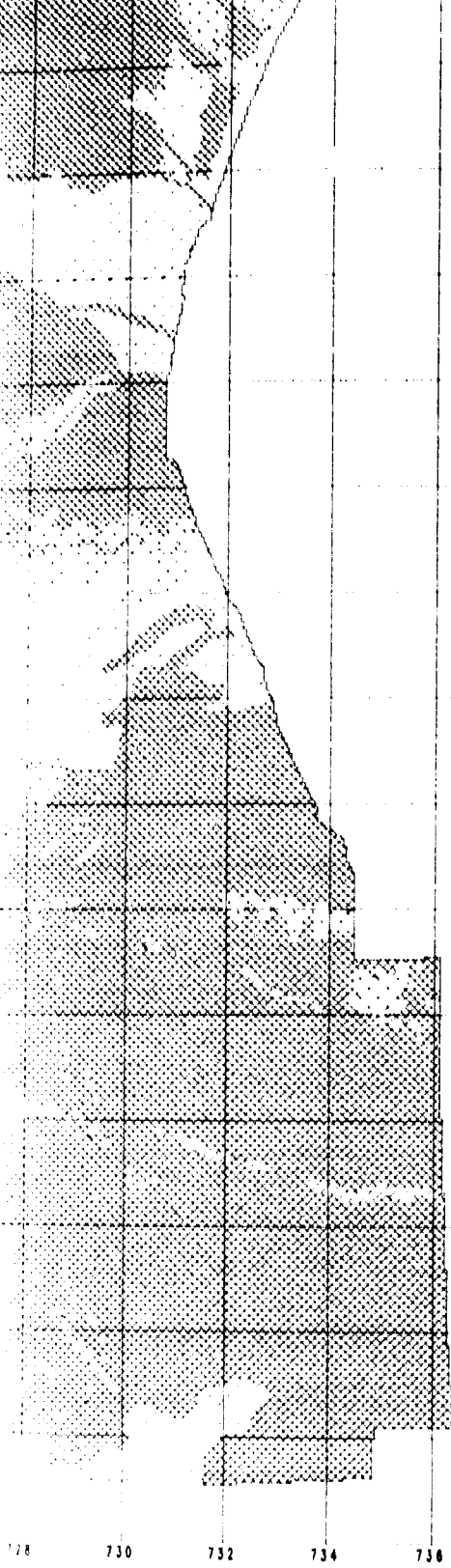











Plate 53. Soil erosion severity for 3-3-5 and





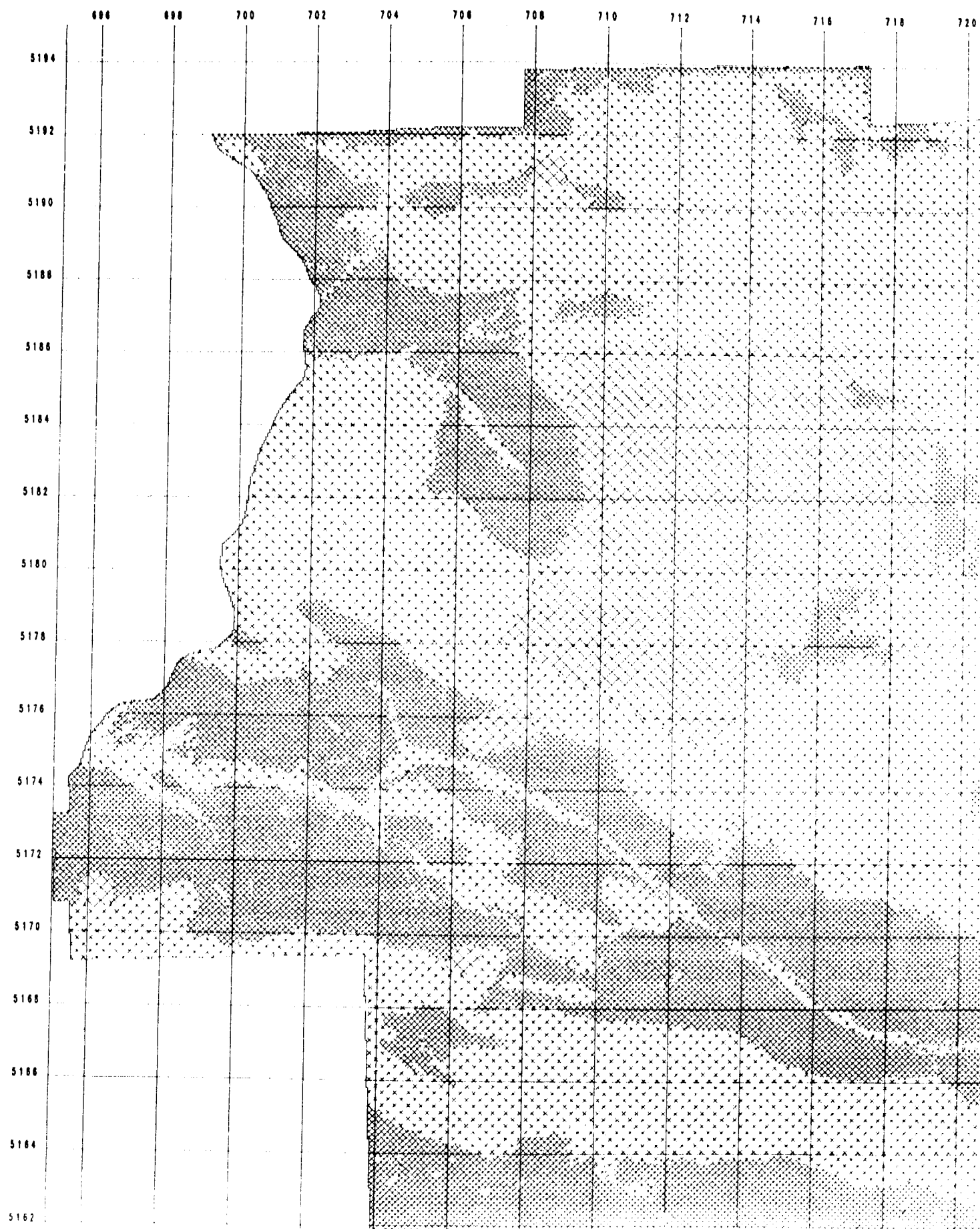
 URBAN/OFF LIMITS
 NO EROSION
 > 0 - 1
 > 1 - 5

 > 5 - 10
 > 10 - 20
 > 20 - 30
 > 30 - 40
 > 40

YAKIMA FIRING CENTER
 3-3-5 FORCE STRUCTURE
 1000 PASSES



structures for one thousand passes



712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

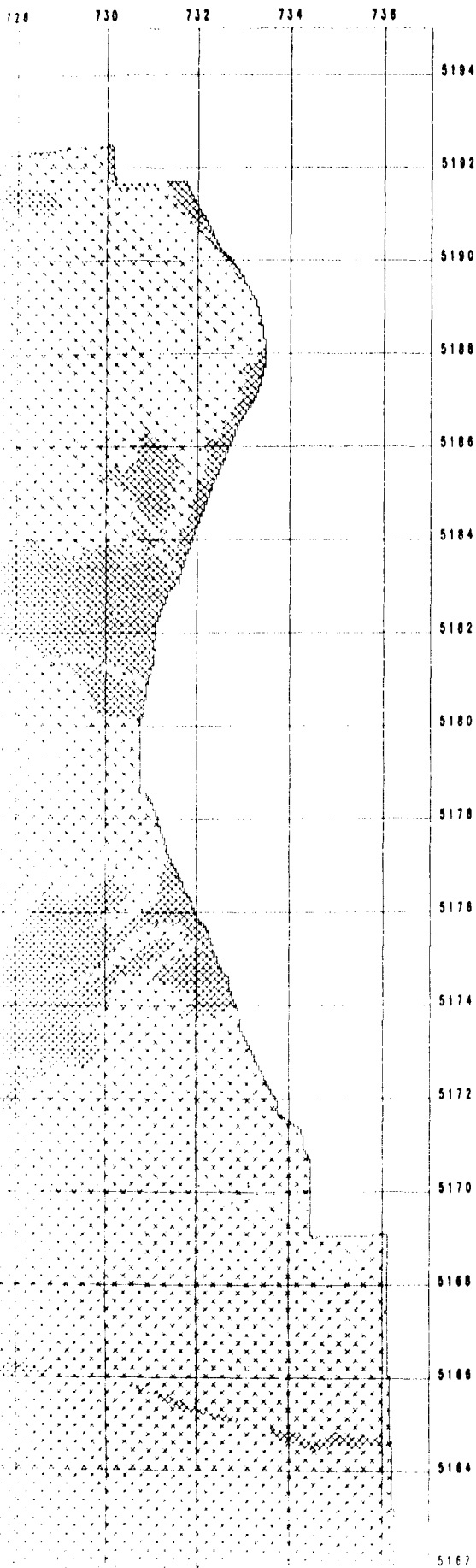
5164

5162



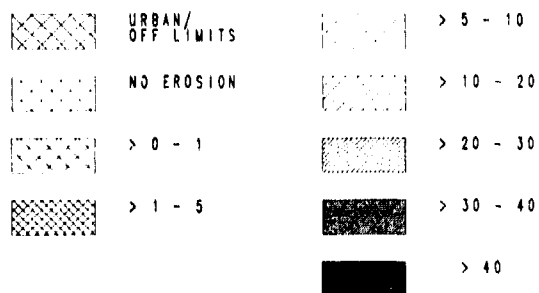
TOTAL P





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
10 PASSES

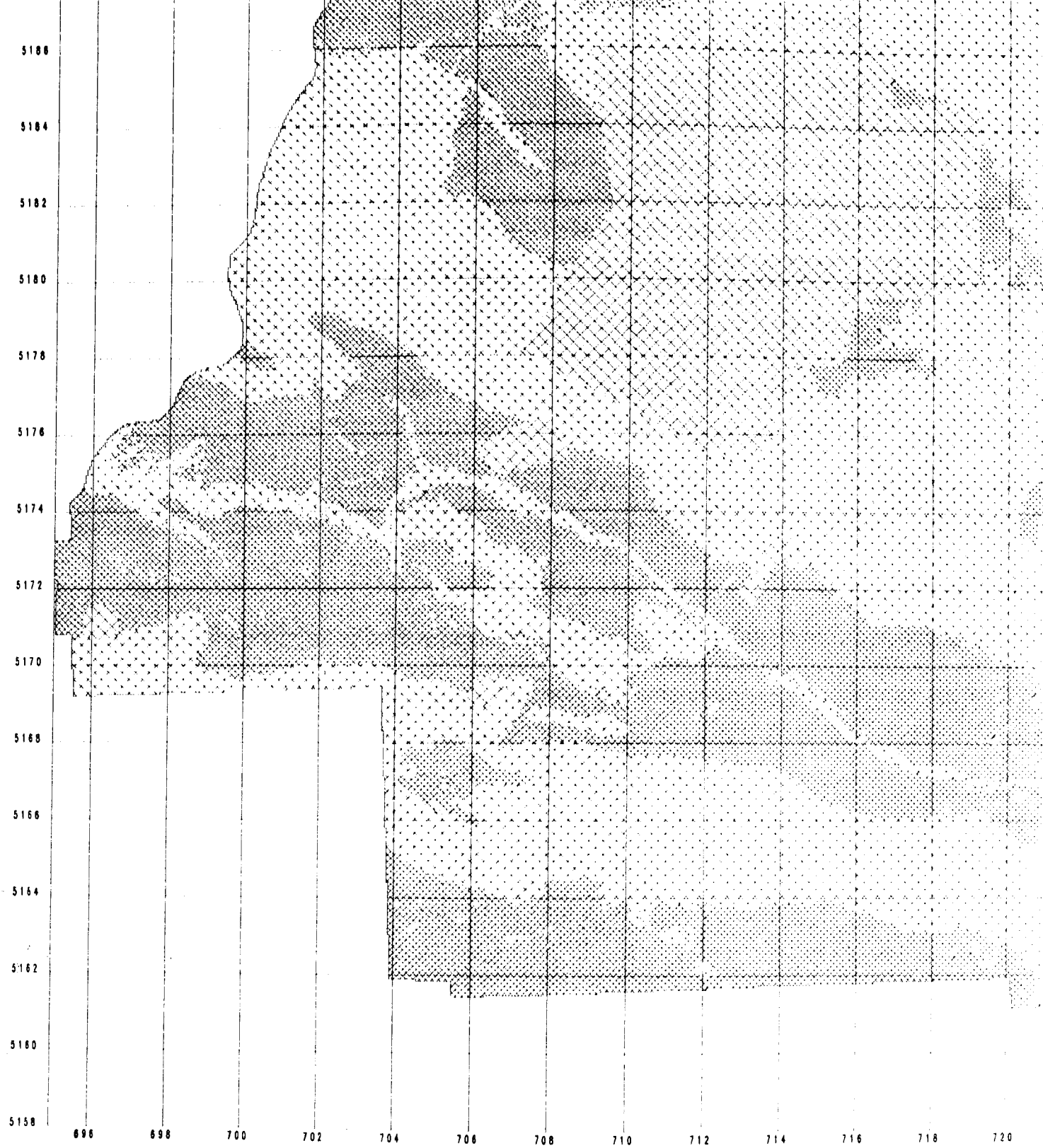


Plate 54. Soil erosion severity

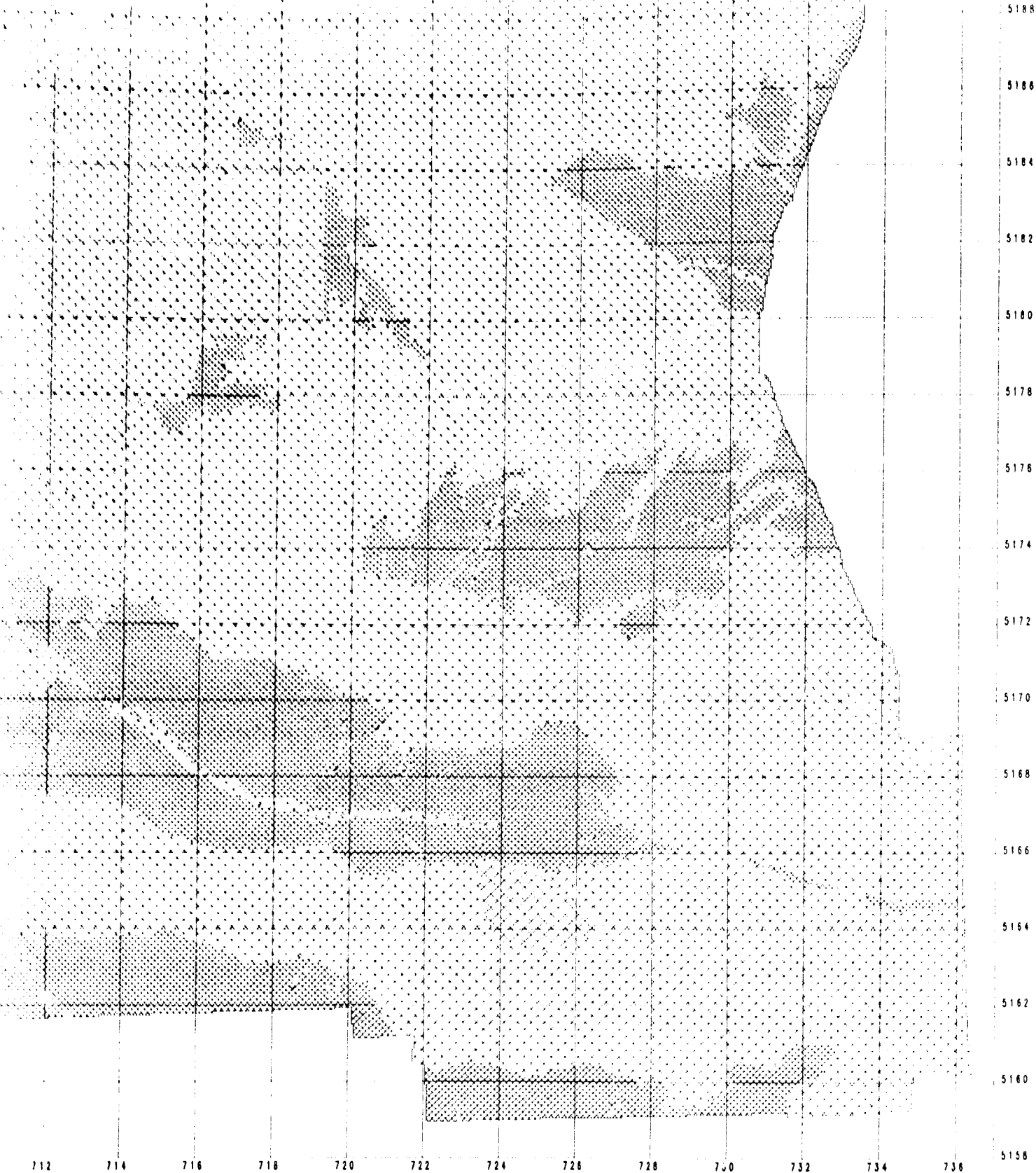
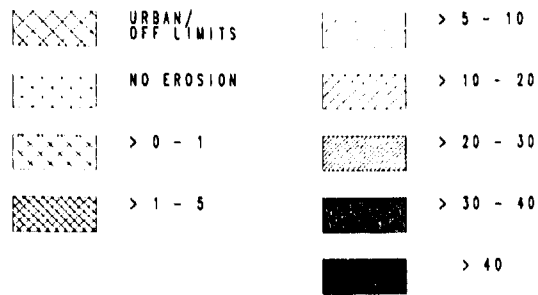
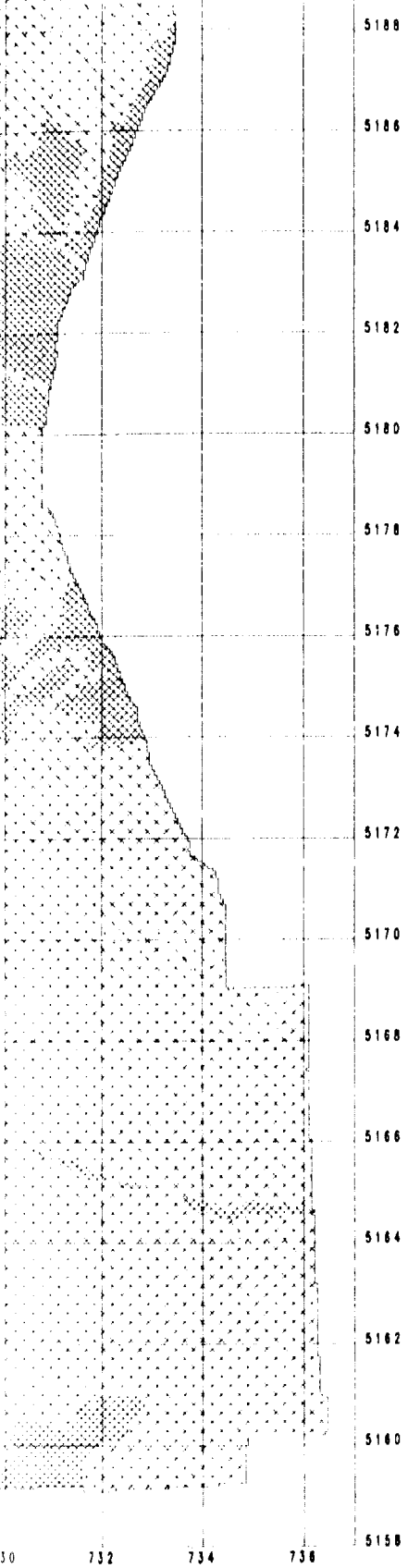
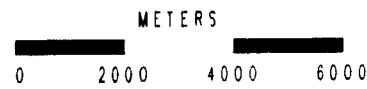


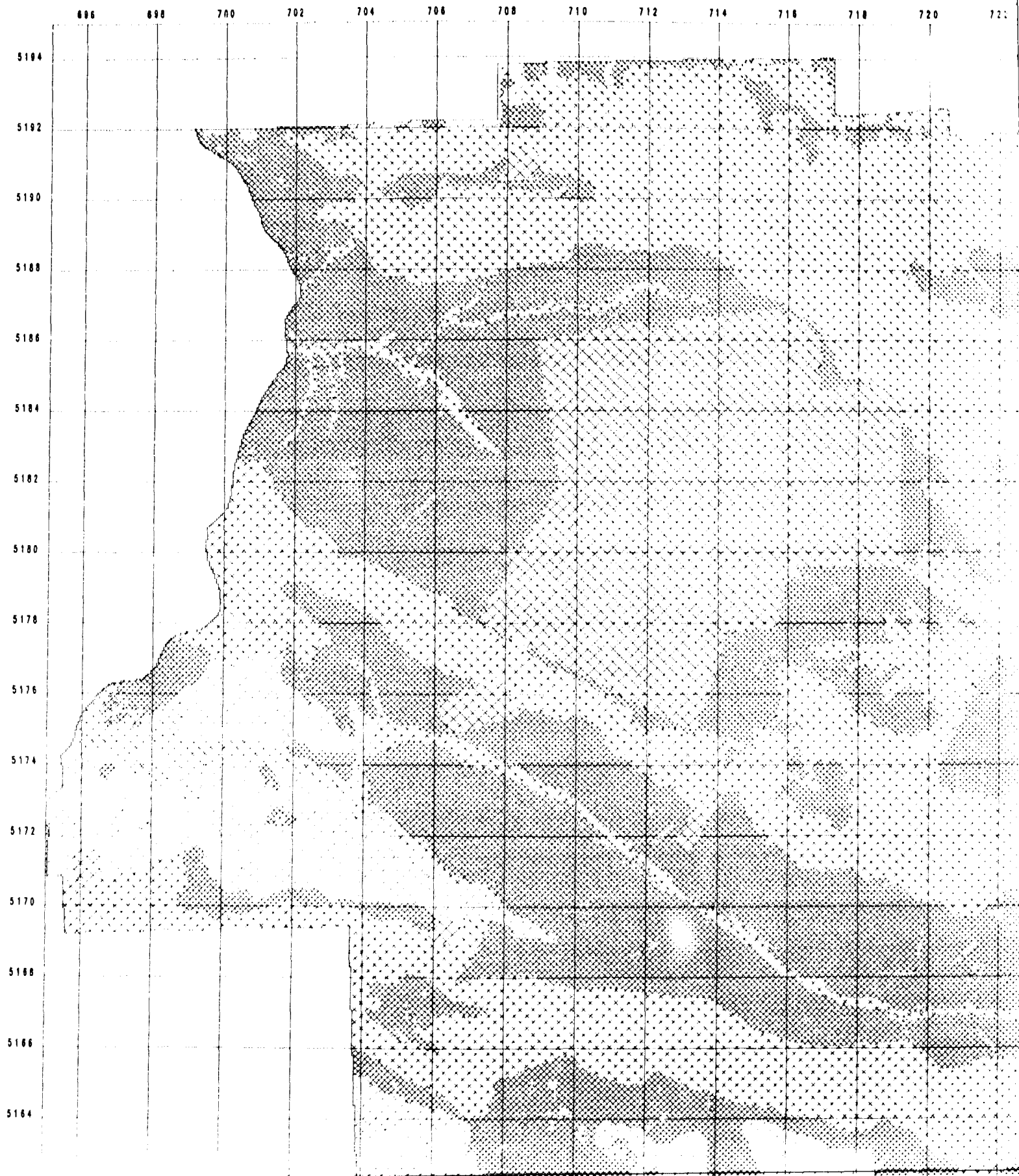
Plate 54. Soil erosion severity for 4-3-3 (8X8) force structure for ten passes



YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
10 PASSES

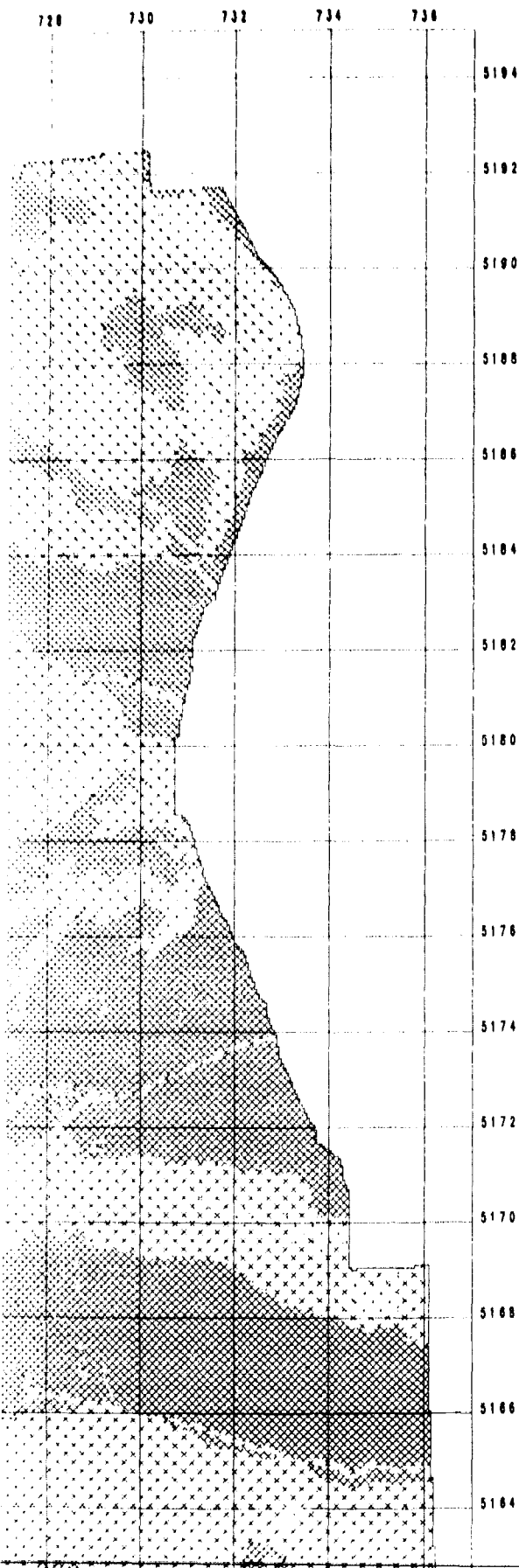


for ten passes





TOTAL P...



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
50 PASSES

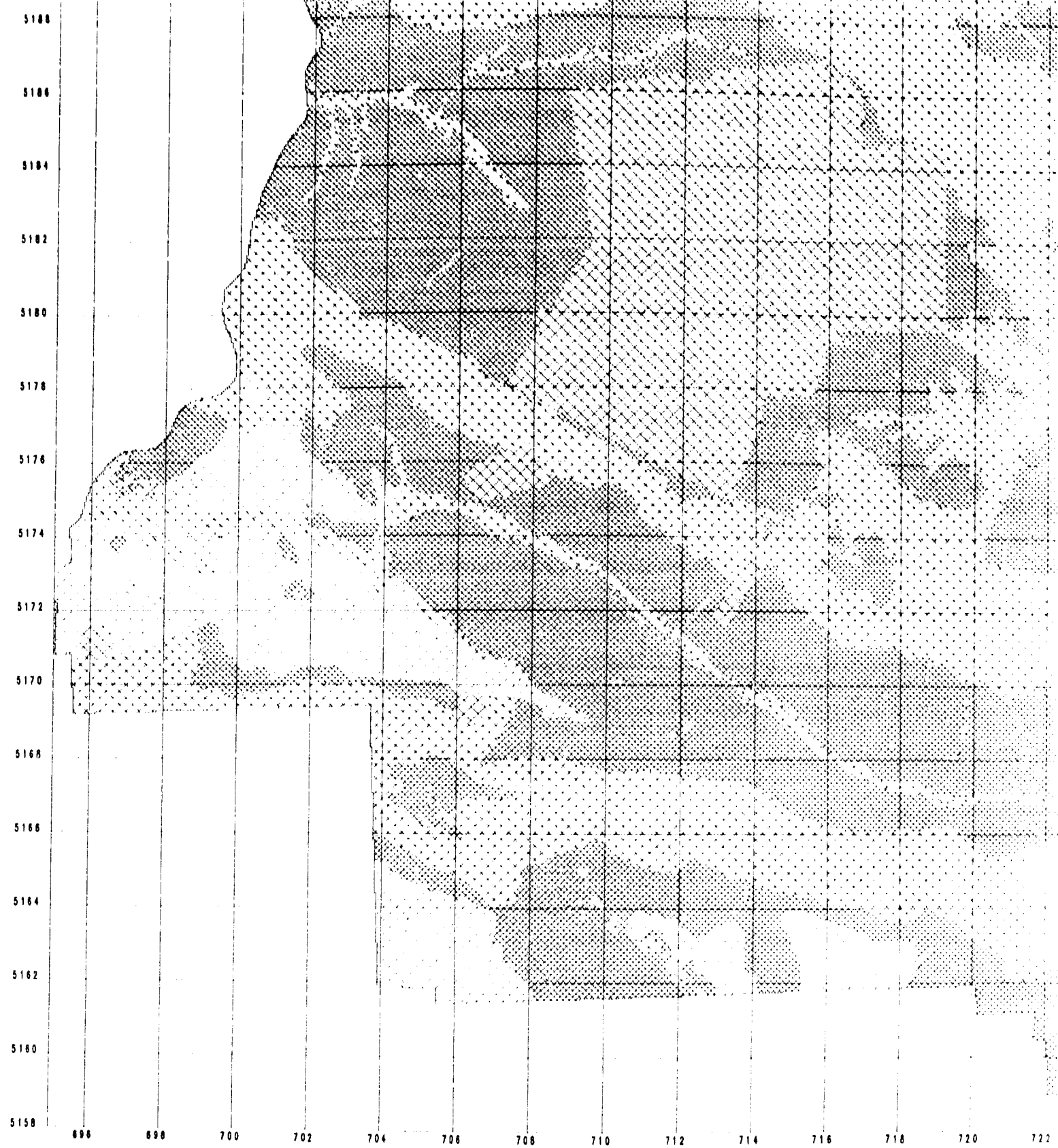


Plate 55. Soil erosion severity fo

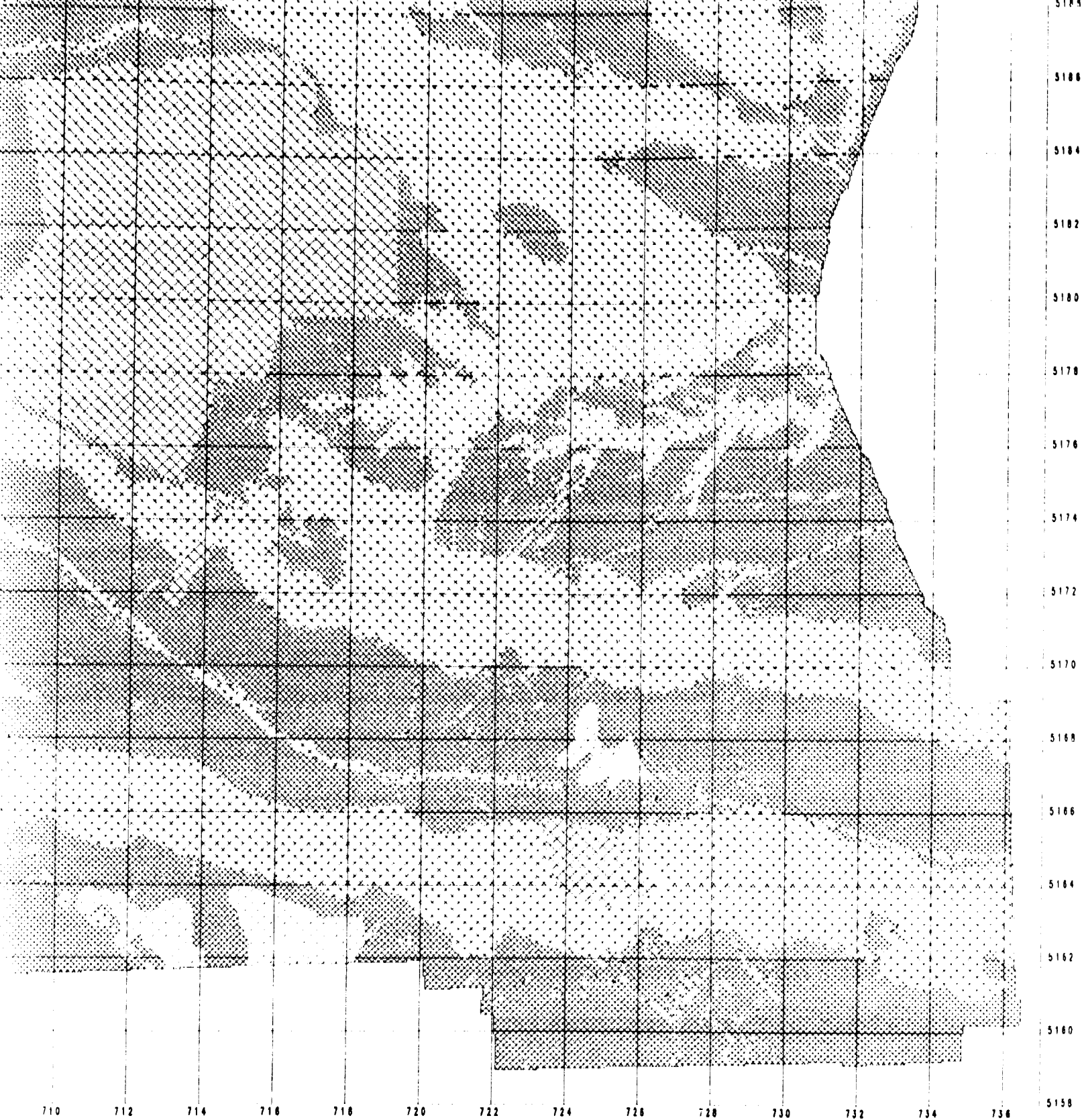
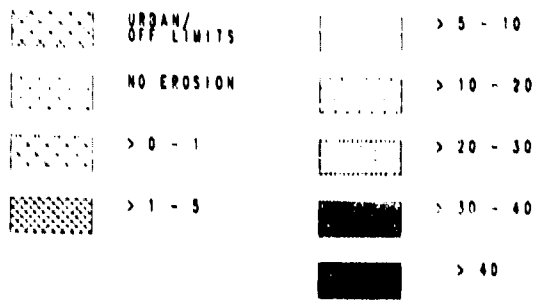
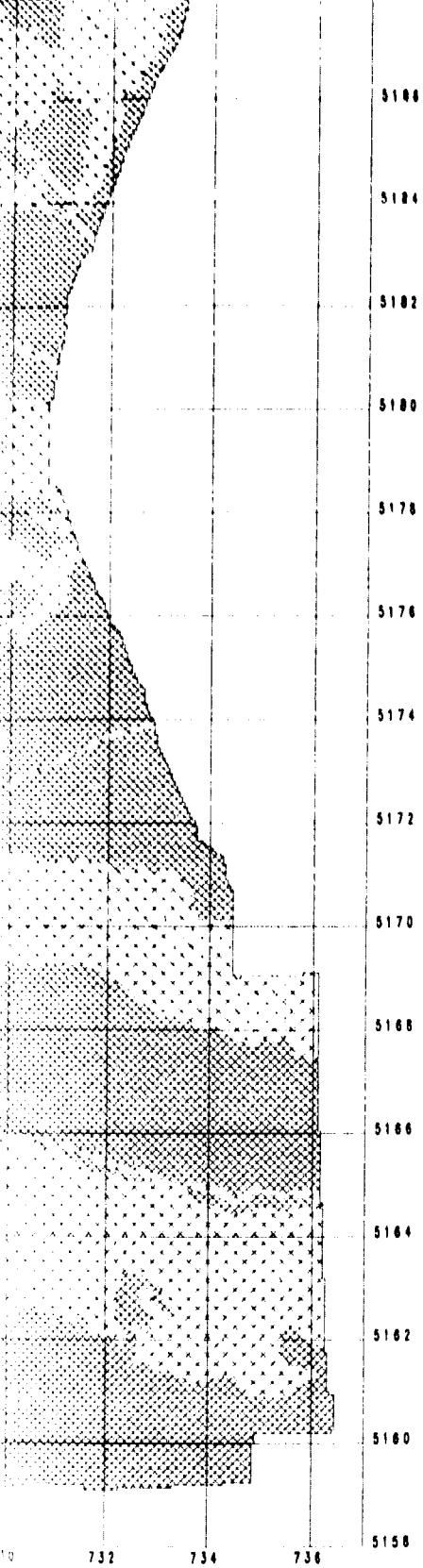
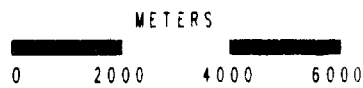


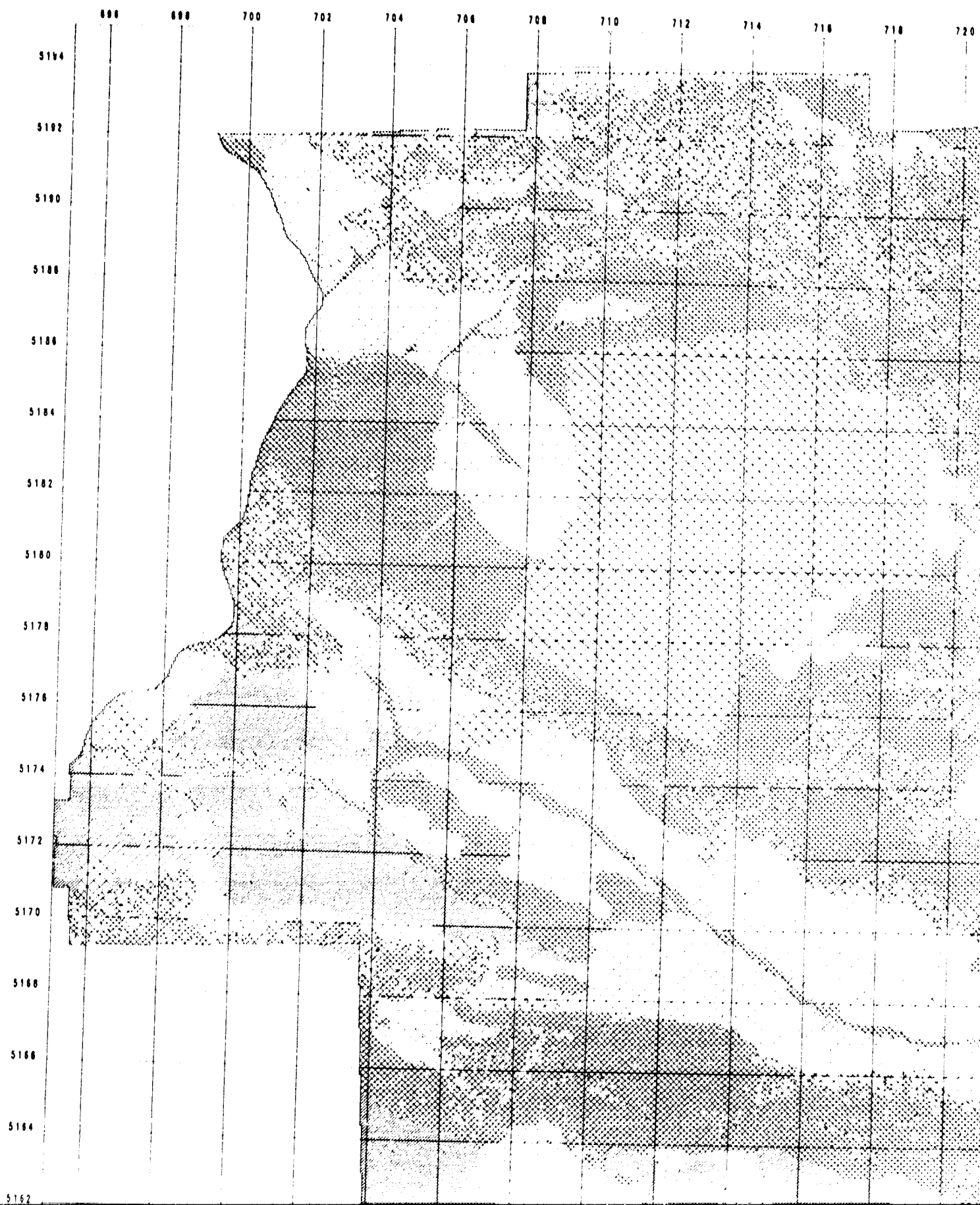
Plate 55. Soil erosion severity for 4-3-3 (8X8) force structure for fifty passes



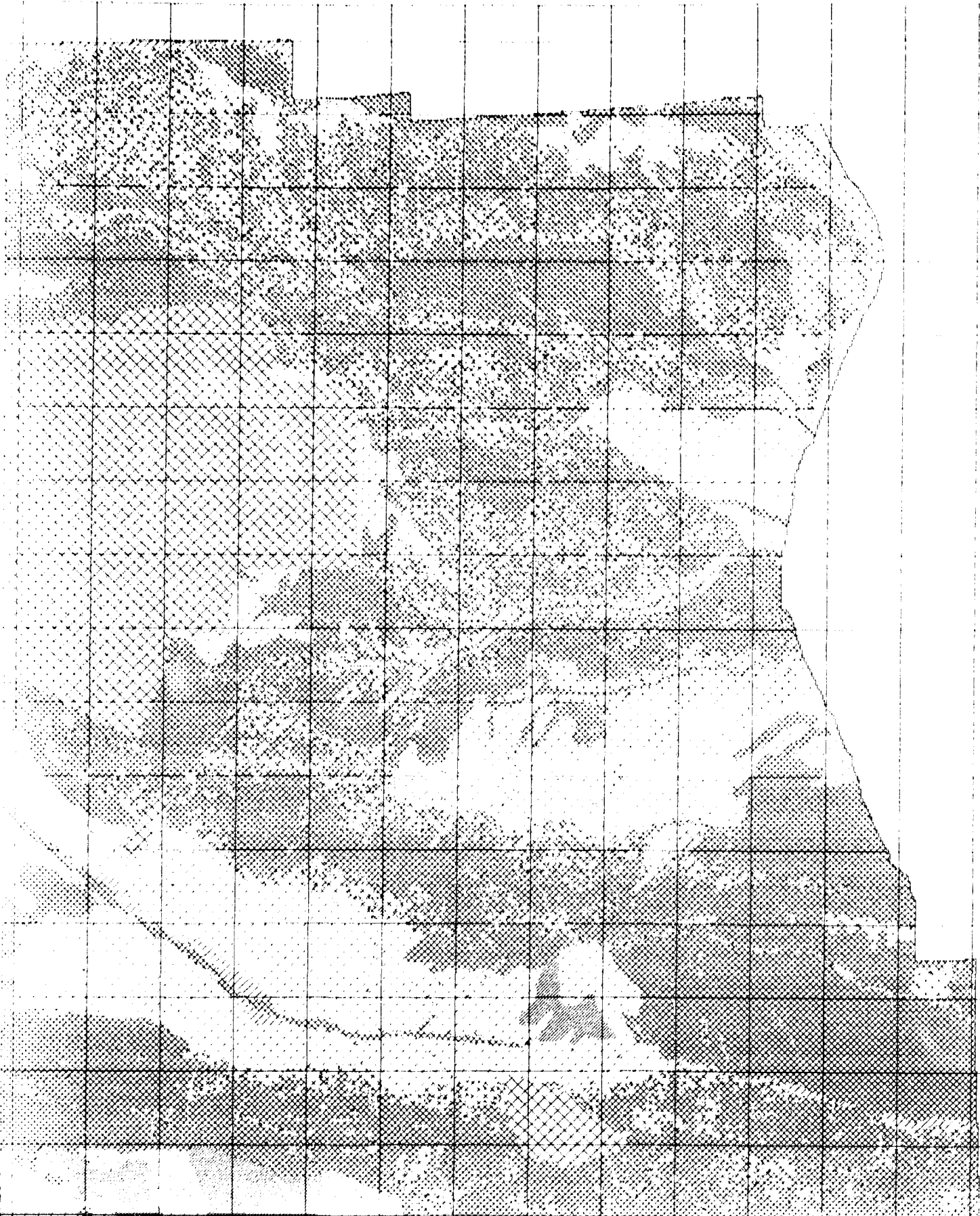
YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
50 PASSES



for fifty passes



710 712 714 716 718 720 722 724 726 728 730 732 734 736



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



T01

728 730 732 734 736

5184

5182

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
1000 PASSES

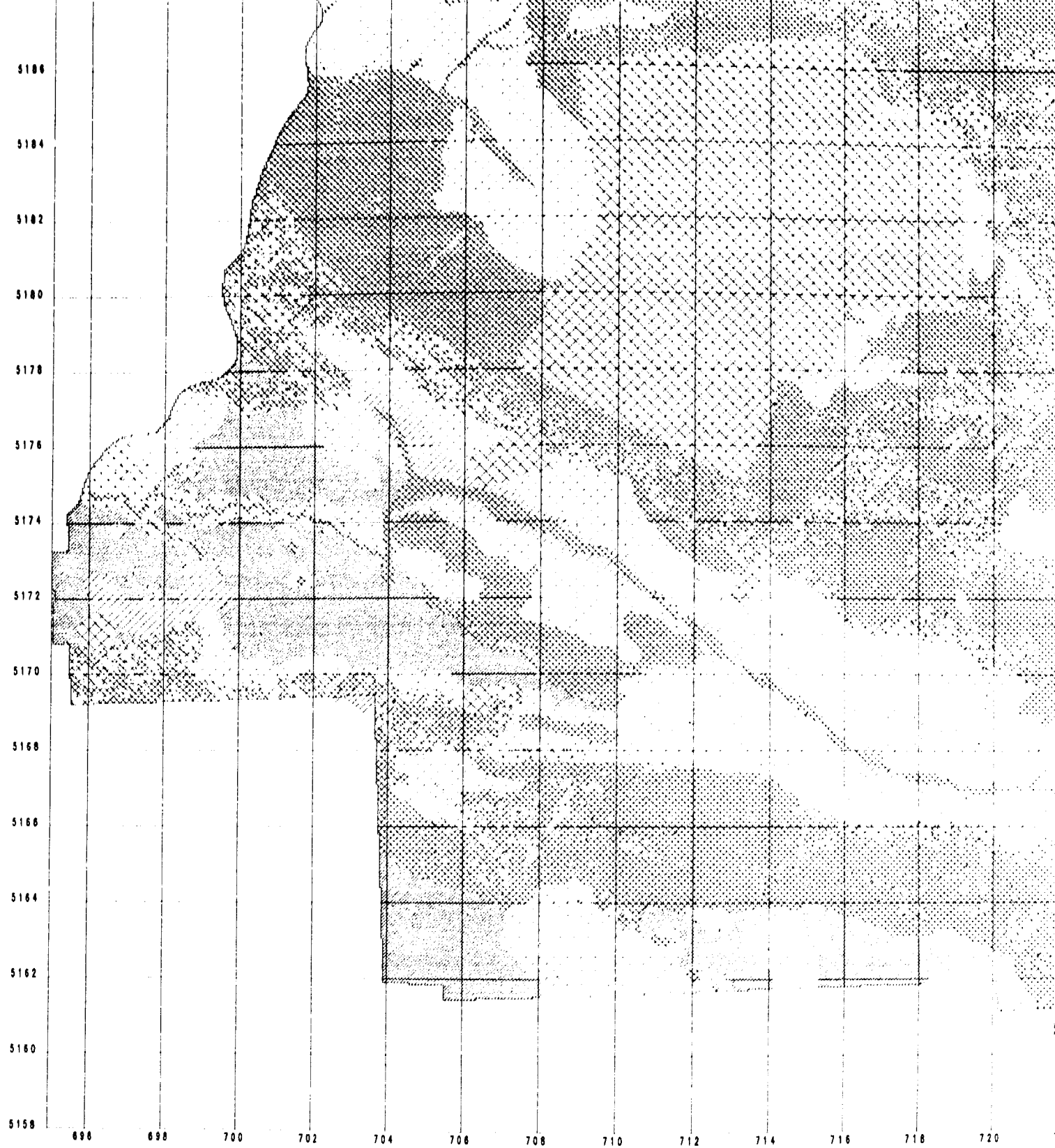


Plate 56. Soil erosion severity for

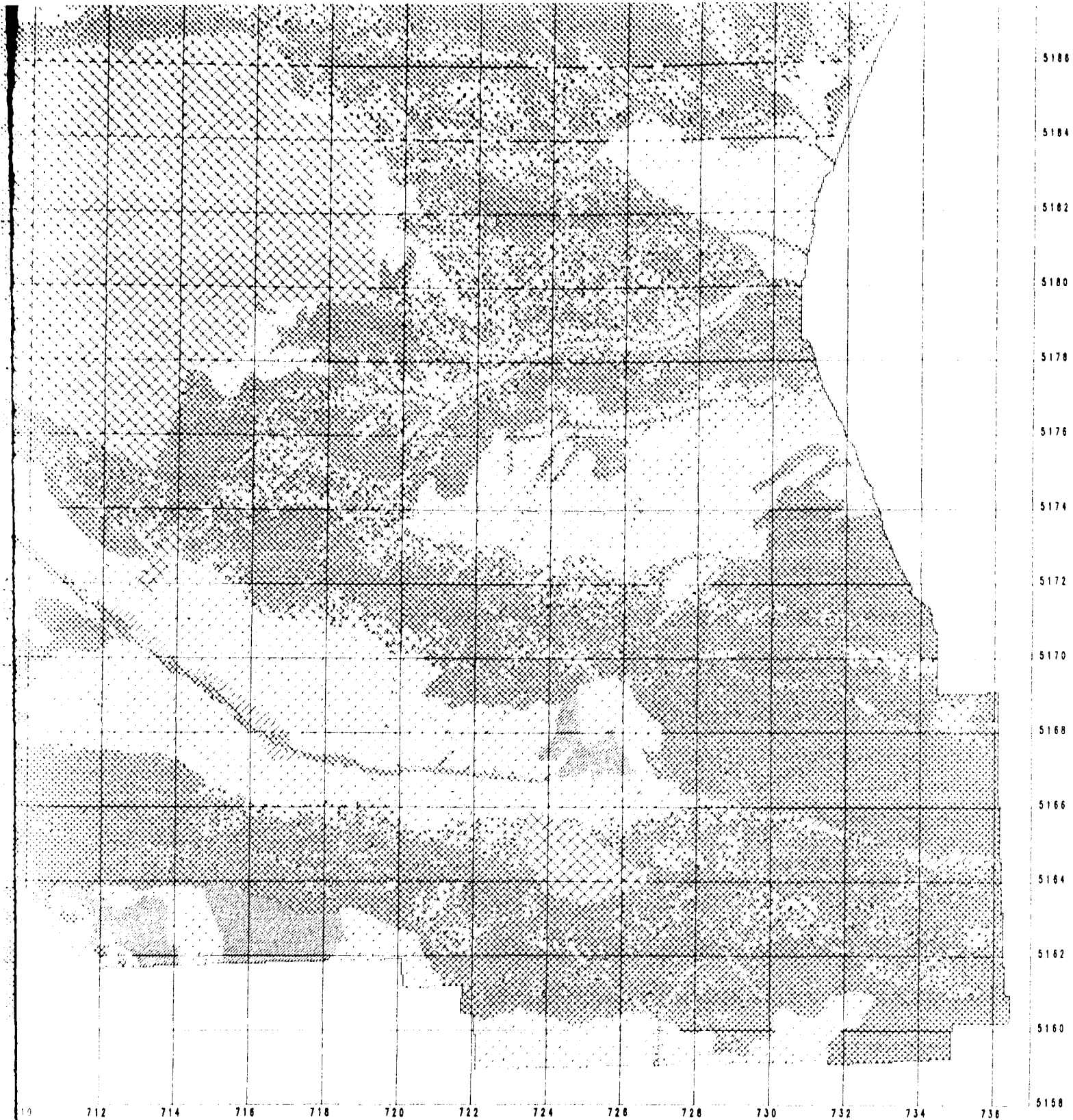
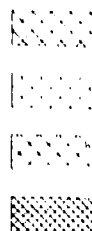
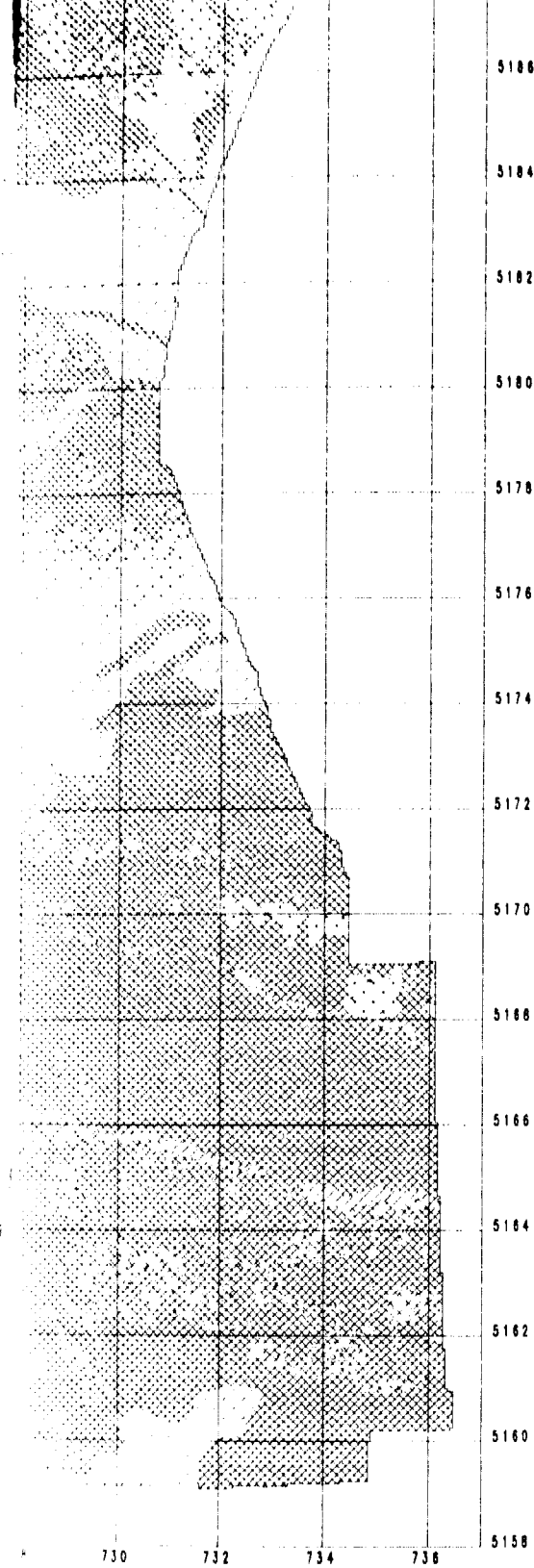


Plate 56. Soil erosion severity for 4-3-3 (8X8) force structure for one thousand passes

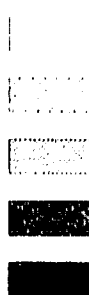


URBAN/
OFF LIMITS

NO EROSION

0 - 1

> 1 - 5



> 5 - 10

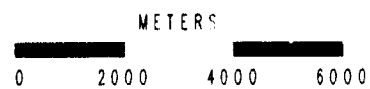
> 10 - 20

> 20 - 30

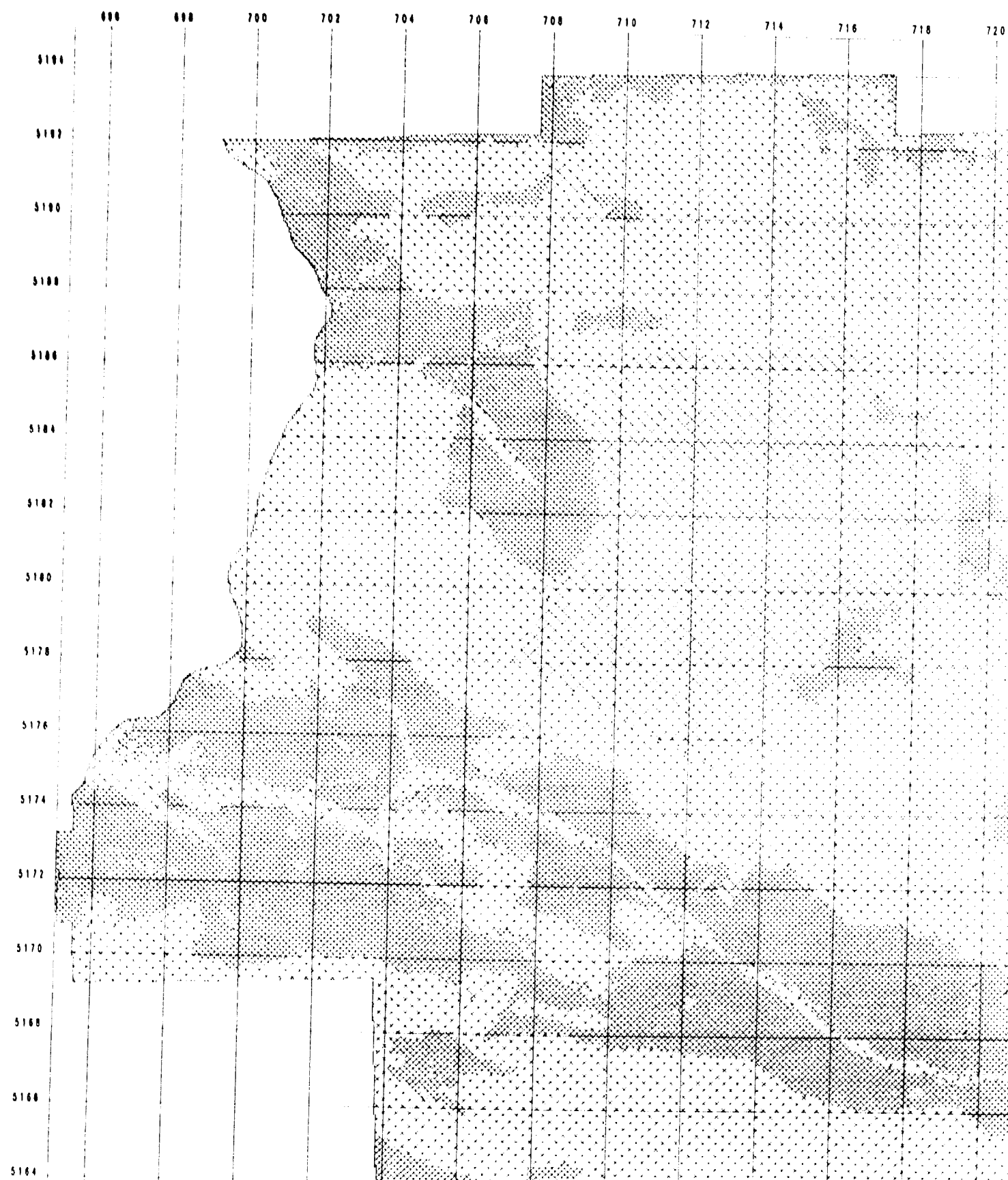
> 30 - 40

> 40

YAKIMA FIRING CENTER
4-3-3 FORCE STRUCTURE
1000 PASSES



ture for one thousand passes



712 714 716 718 720 722 724 726 728 730 732 734 736



5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



TOTAL P.O.

730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
10 PASSES

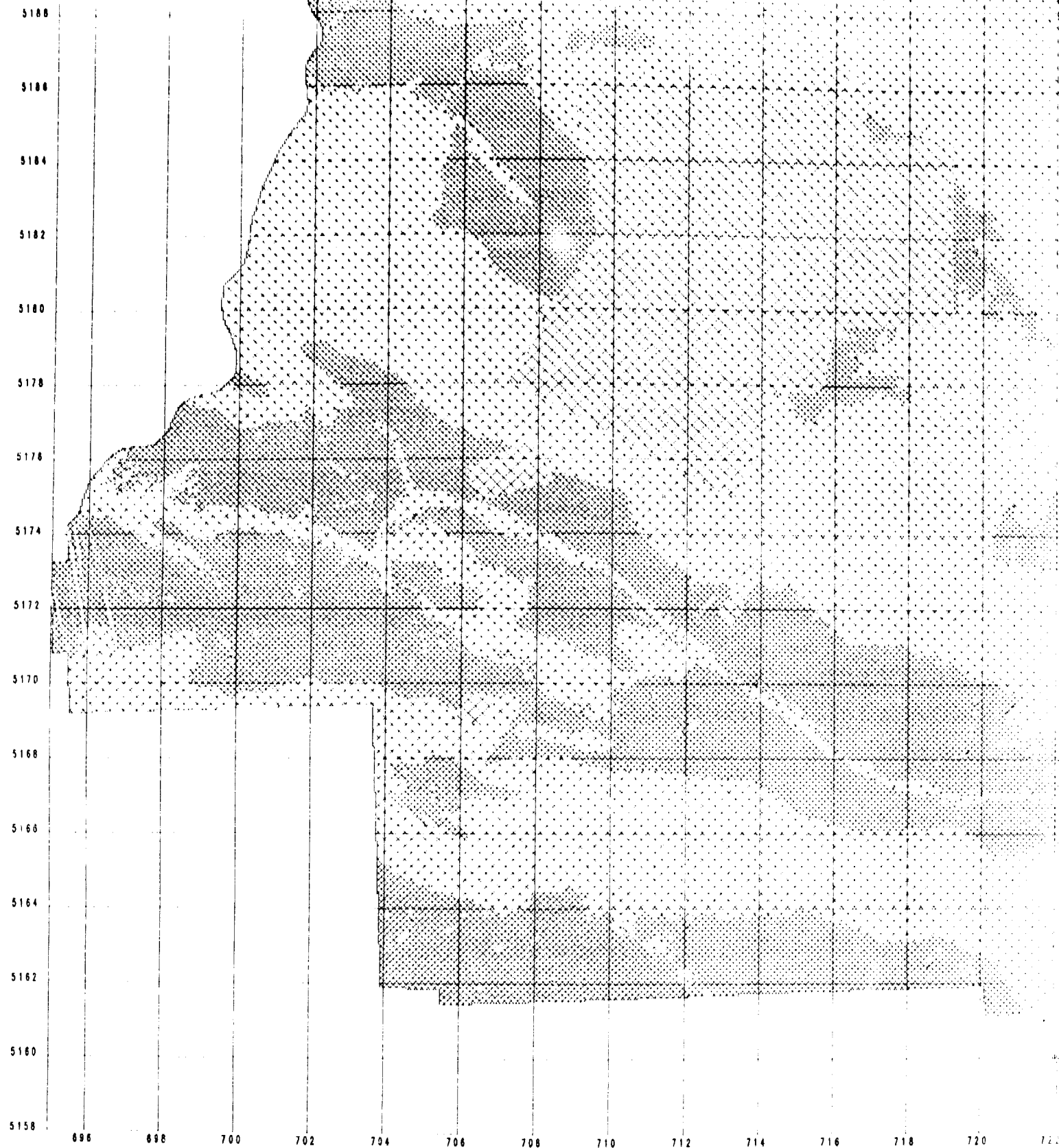


Plate 57. Soil erosion severity

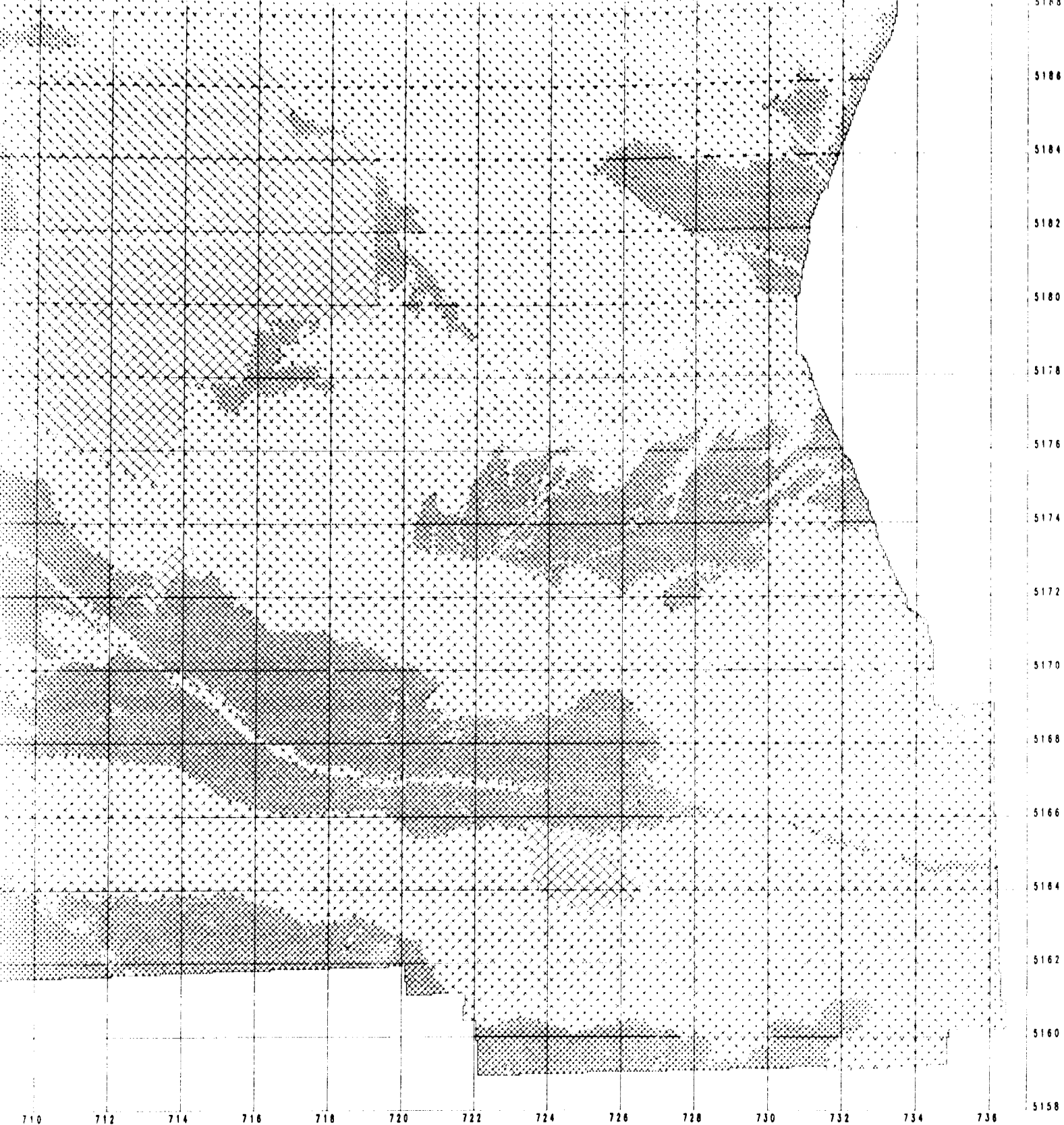
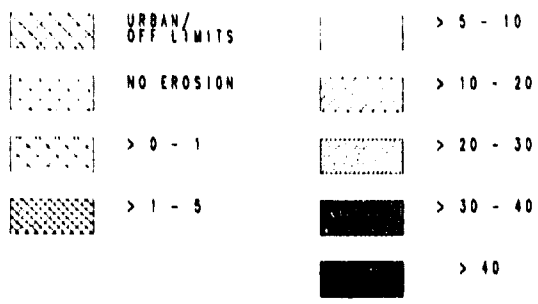
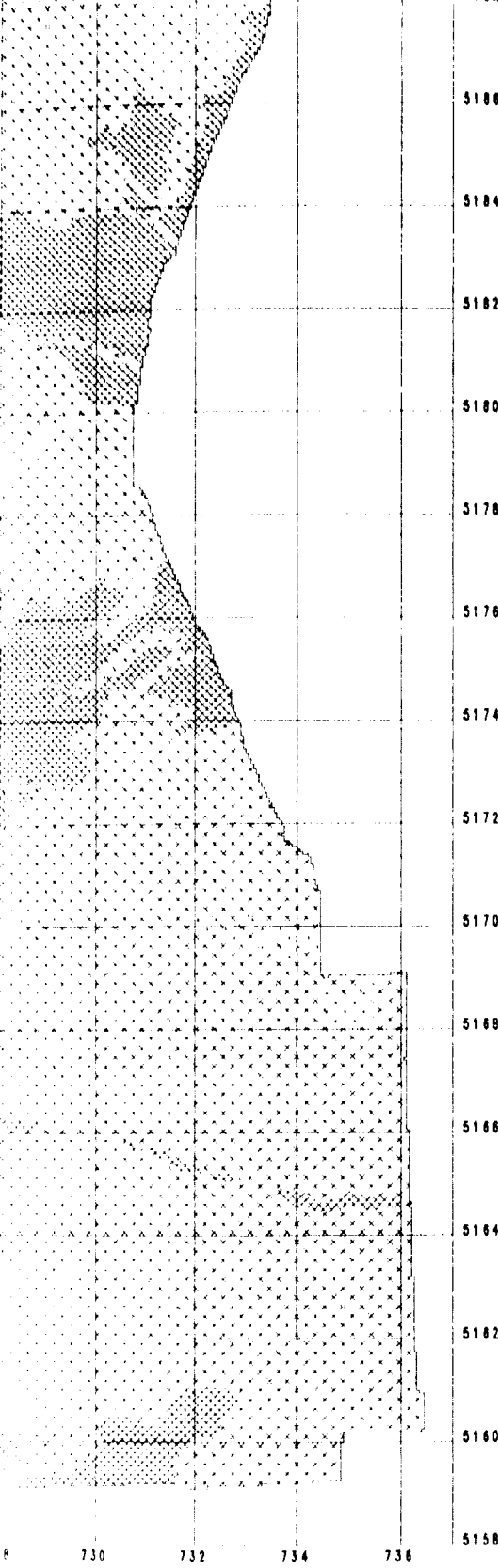


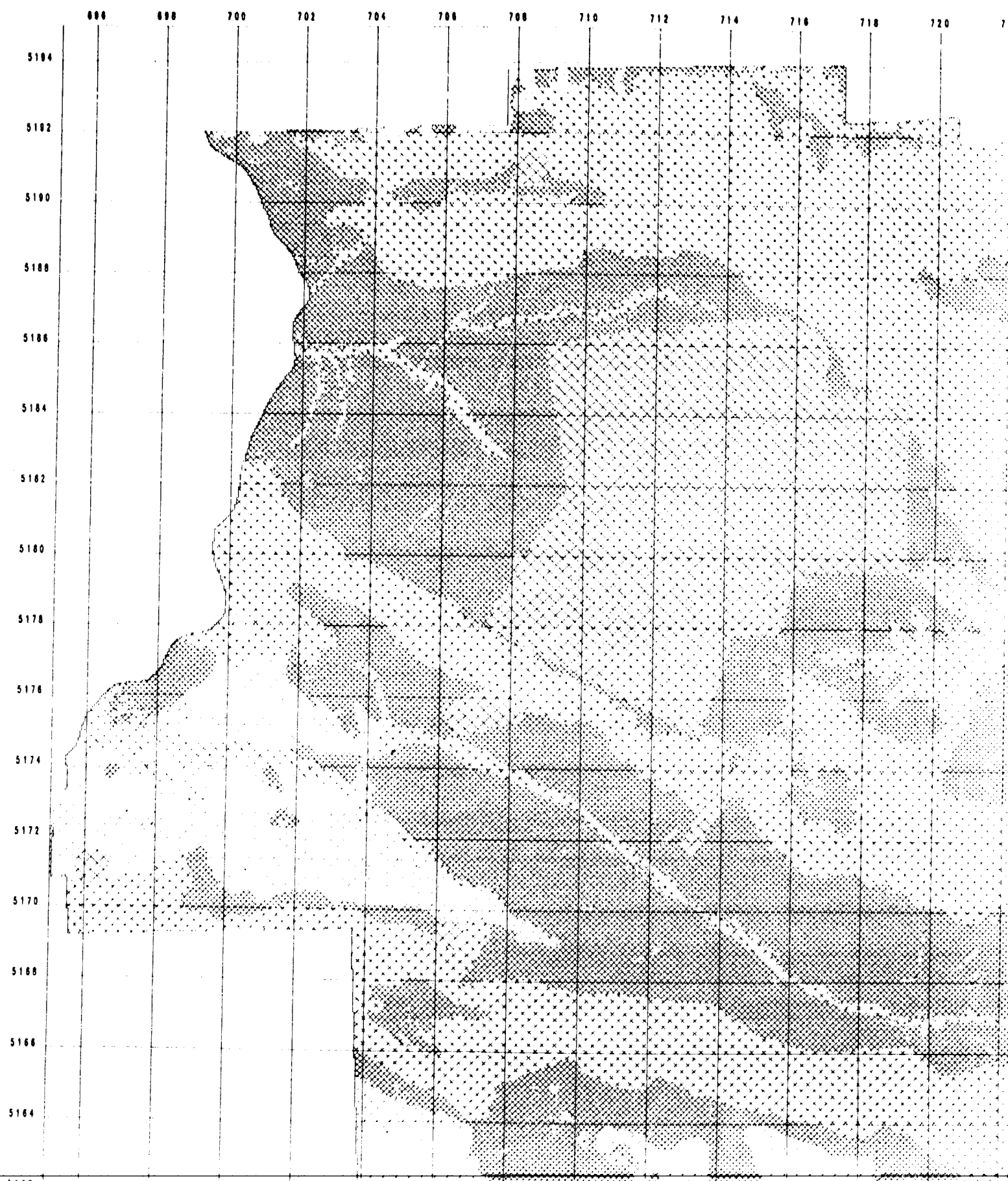
Plate 57. Soil erosion severity for 5-5-0 force structure for ten passes



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
10 PASSES

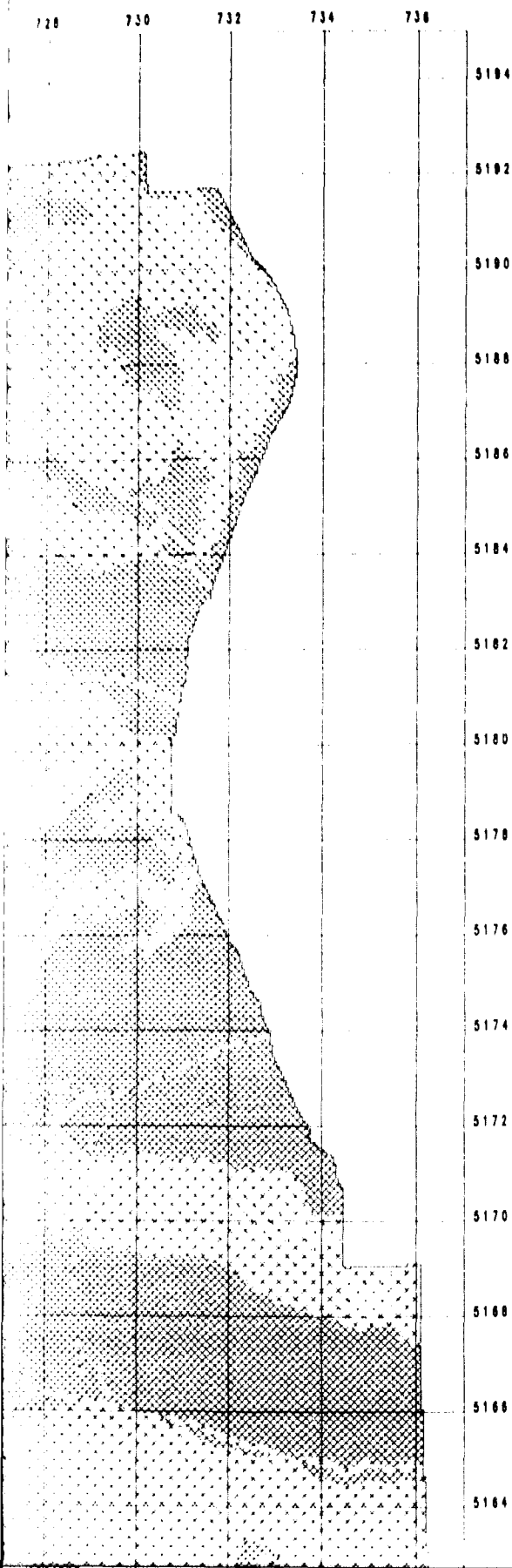


ure for ten passes



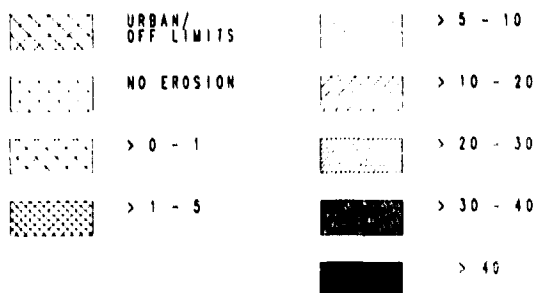


TOTAL H



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
50 PASSES

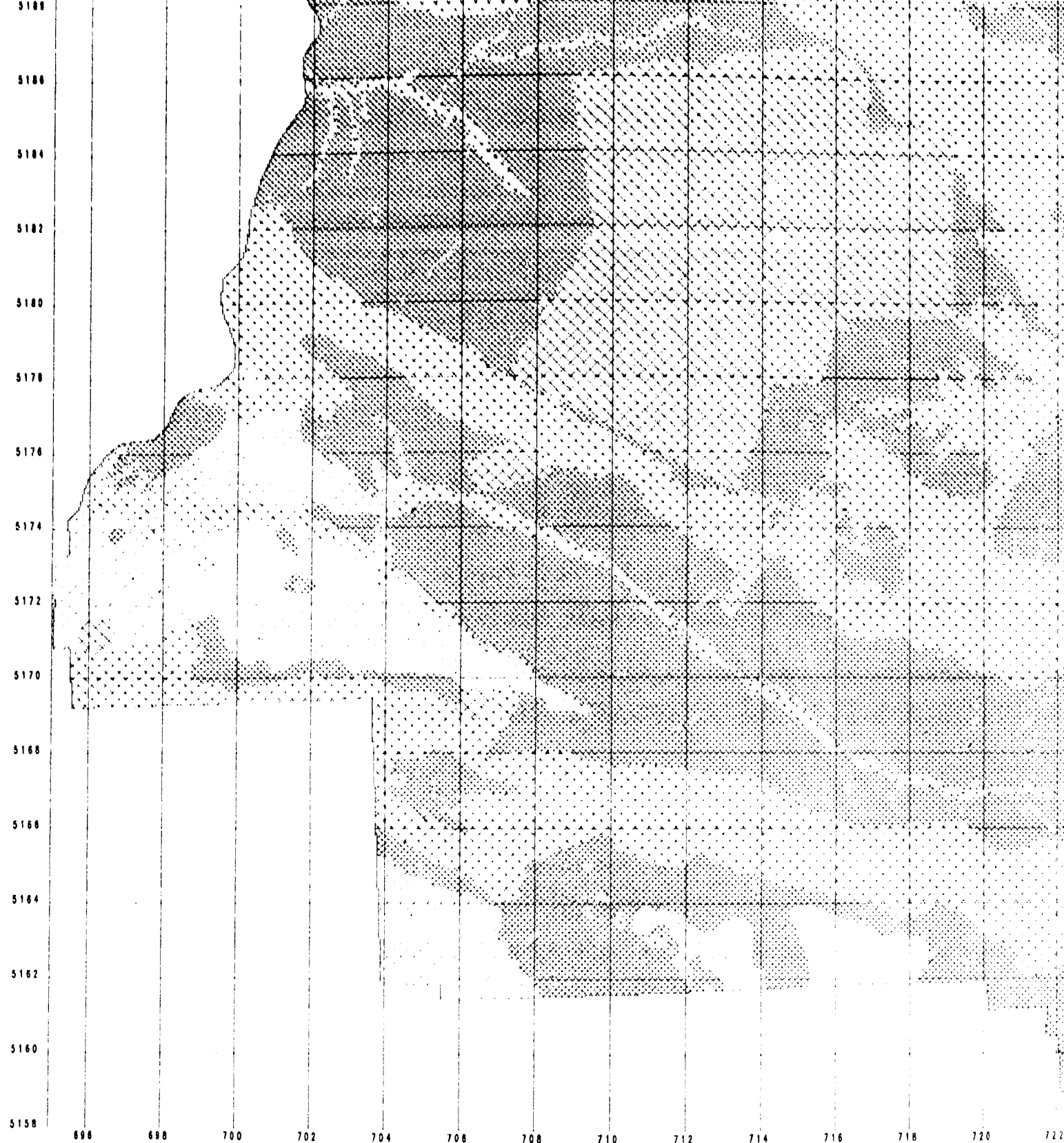


Plate 58. Soil erosion severity

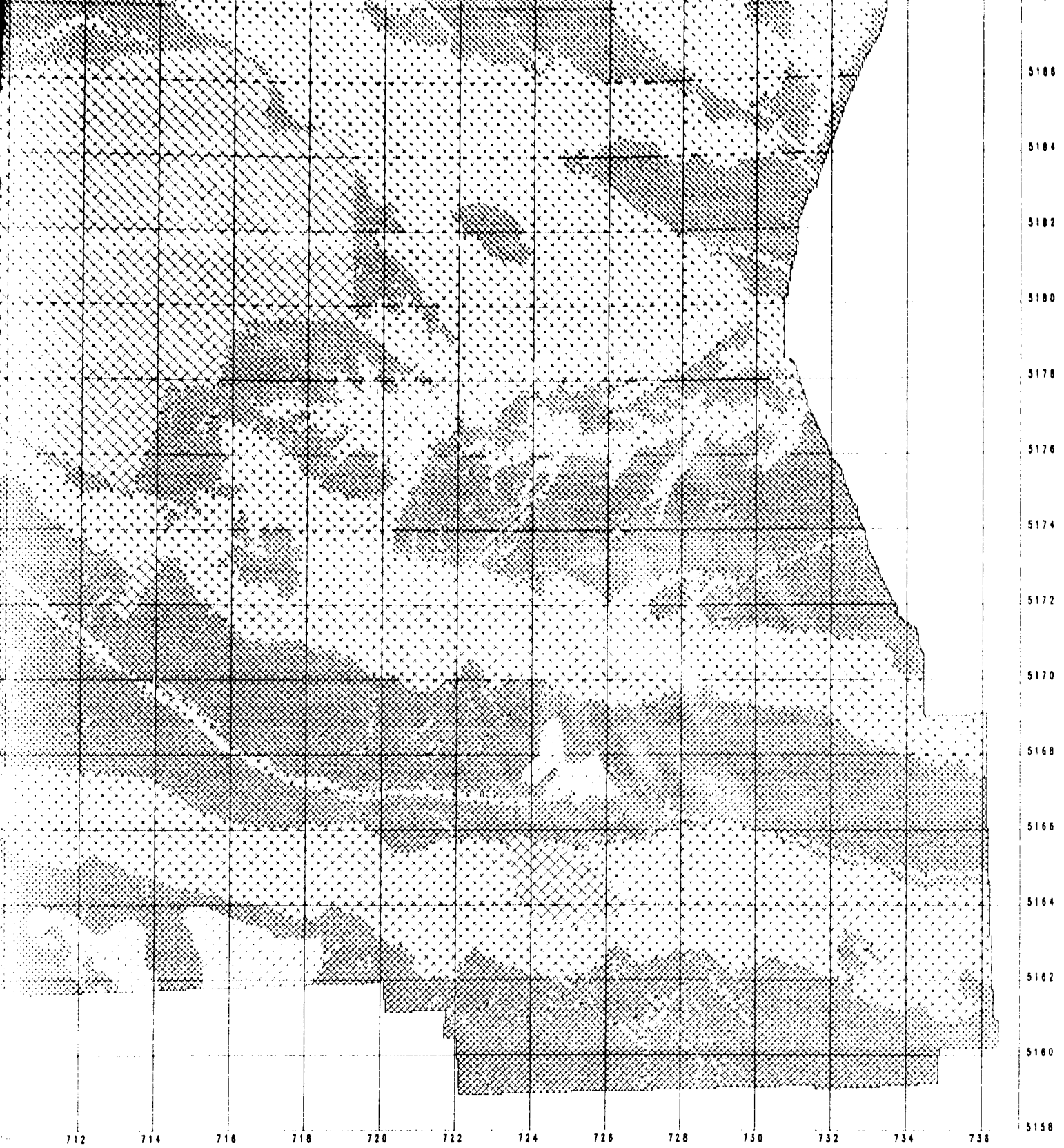
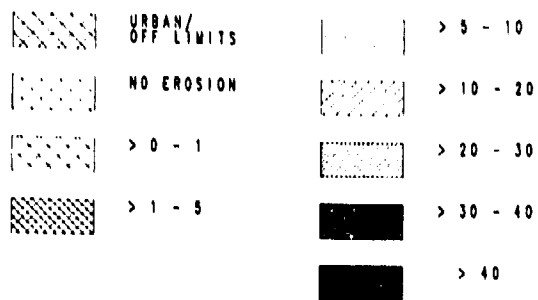
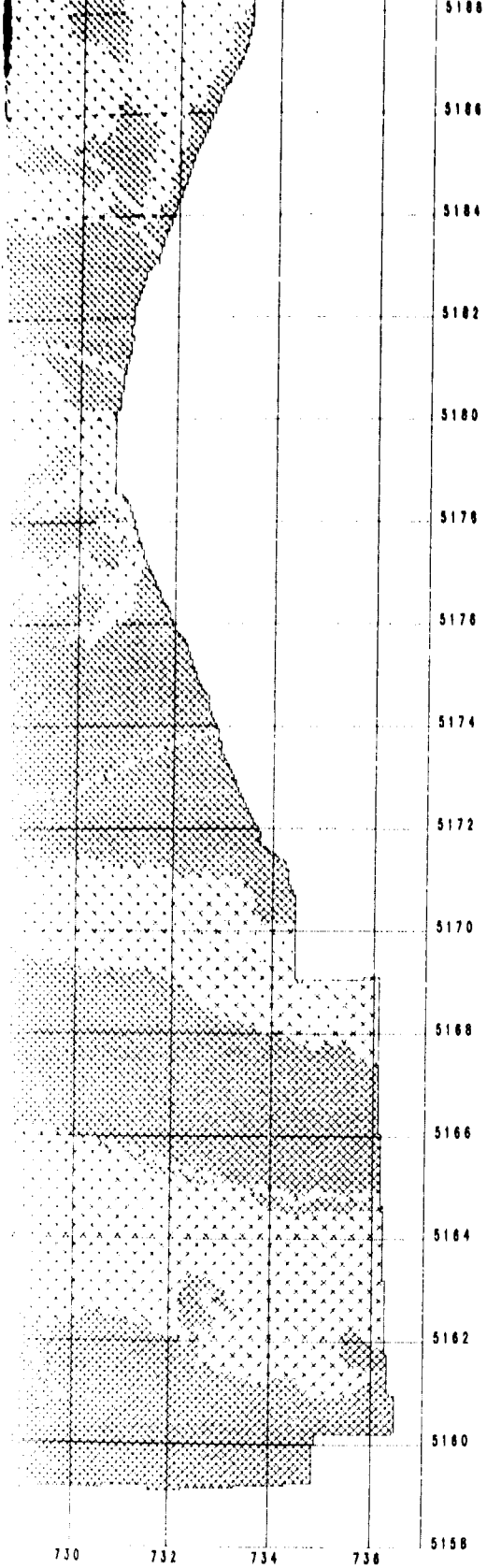
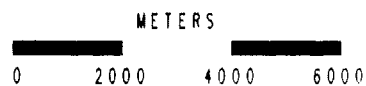


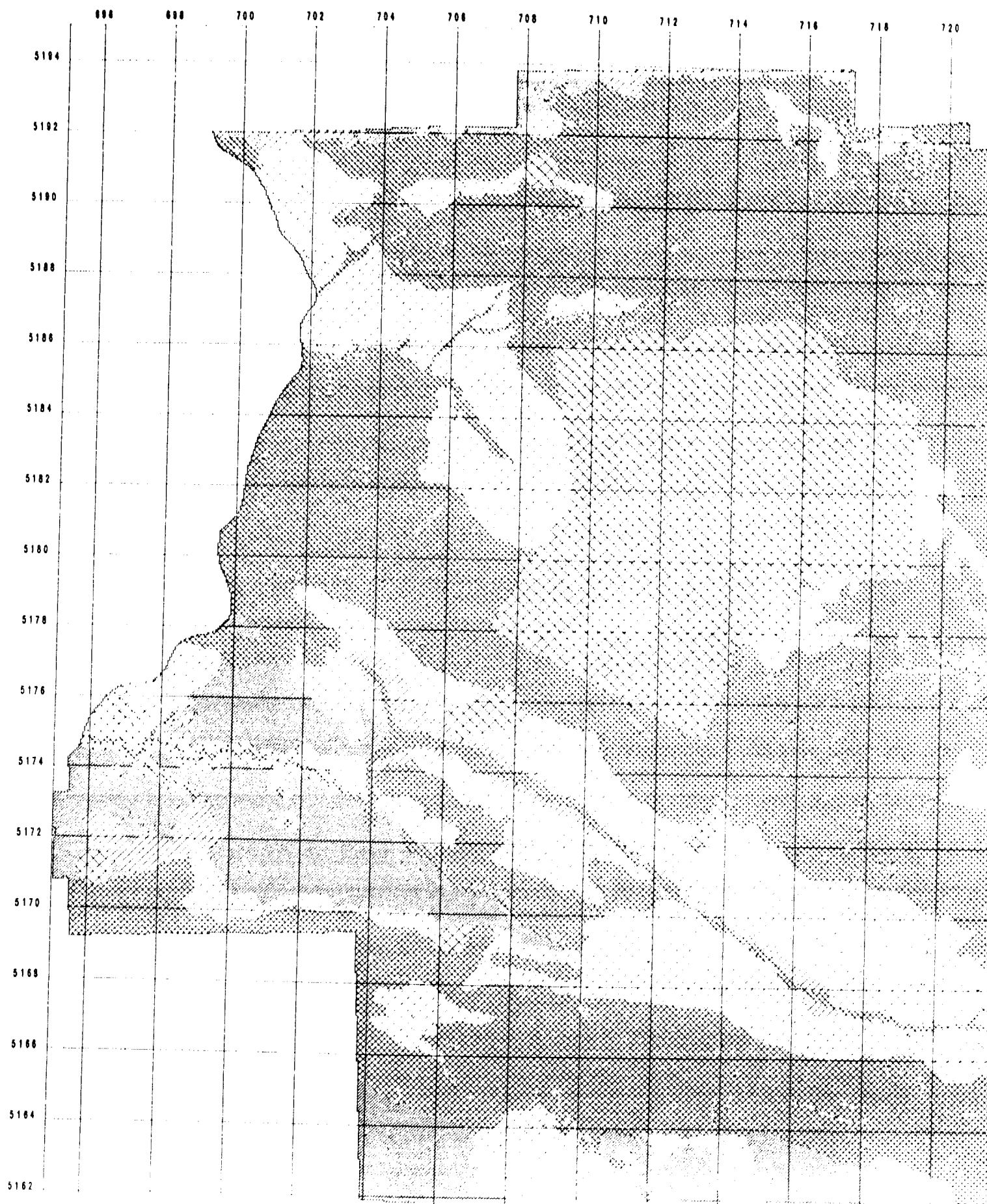
Plate 58. Soil erosion severity for 5-5-0 force structure for fifty passes



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
50 PASSES



re for fifty passes



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

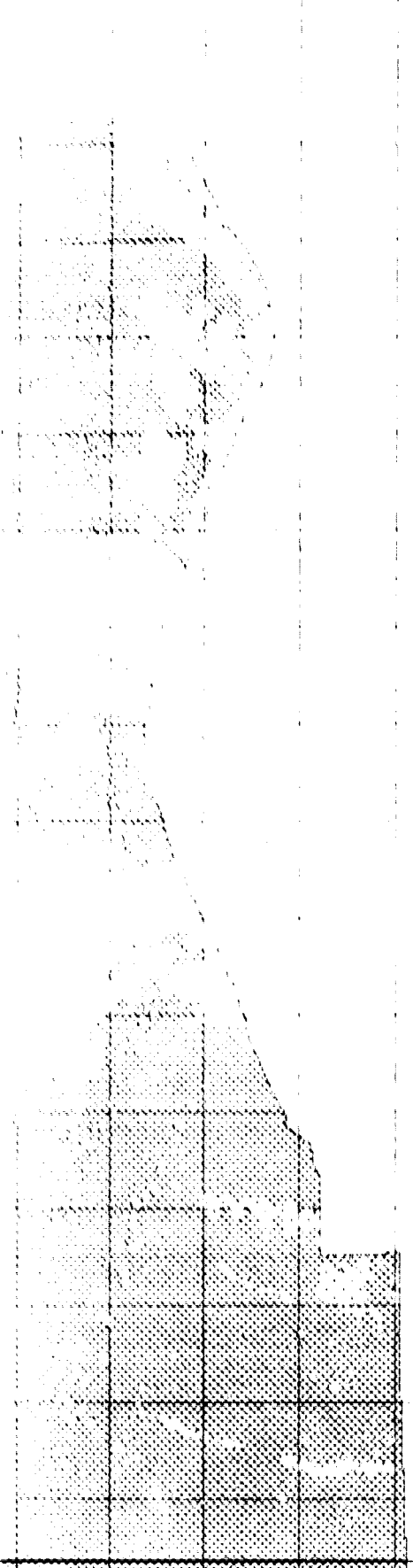
5168

5166

5164

5162

730 732 734 736



5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

	URBAN/ DPH LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
1000 PASSES

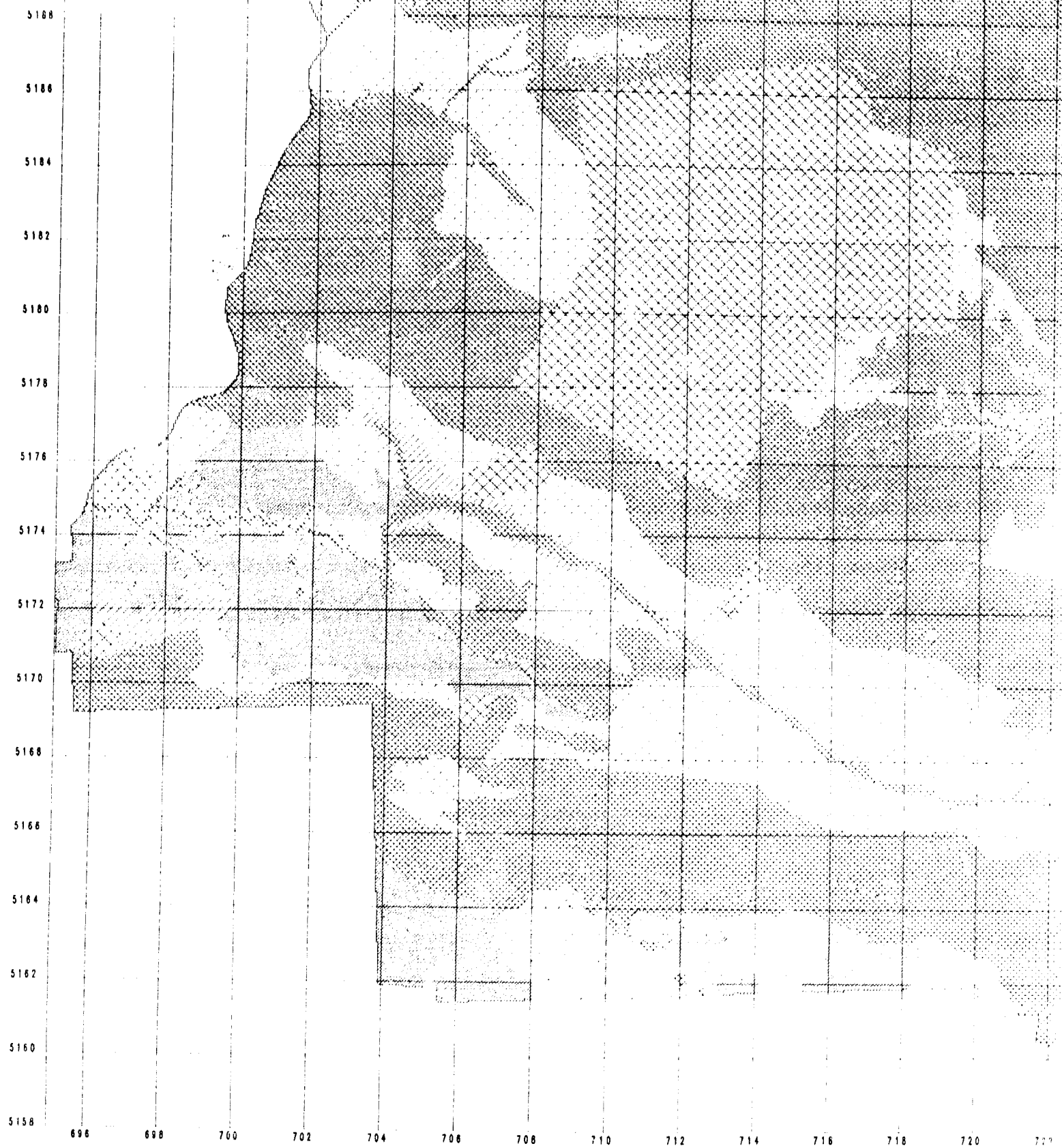


Plate 59. Soil erosion severity f

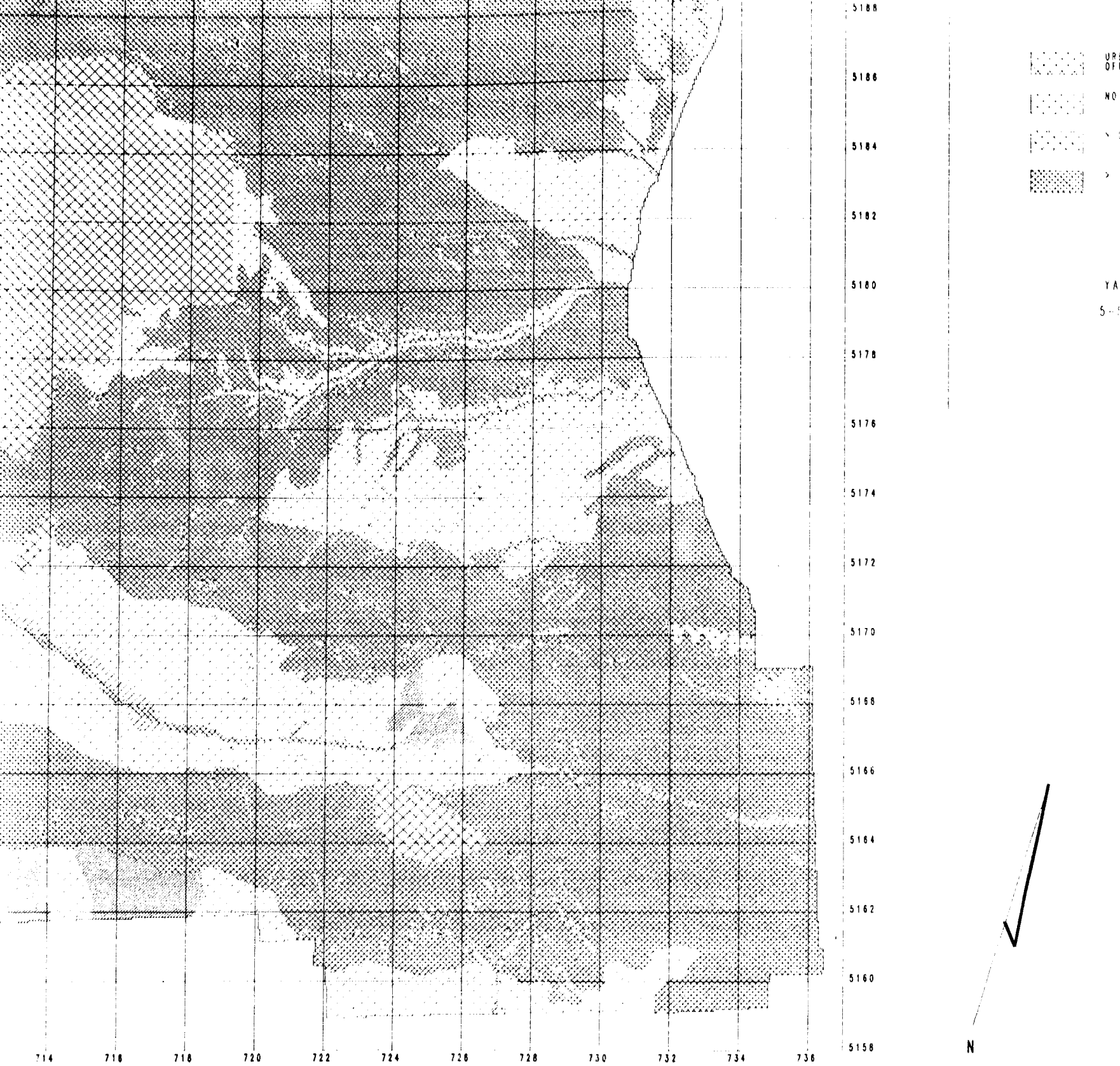
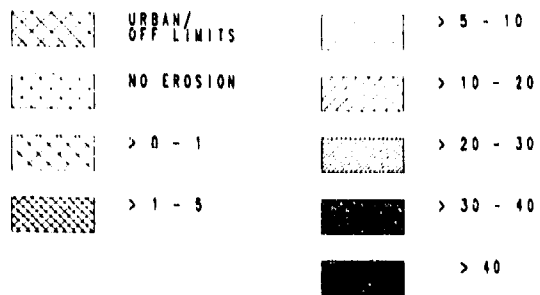
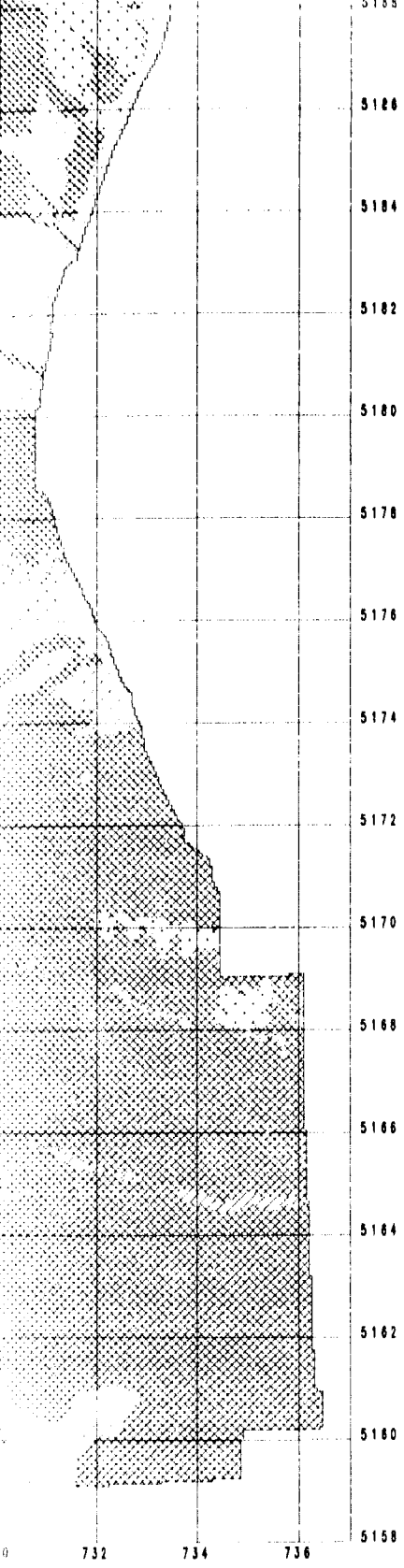
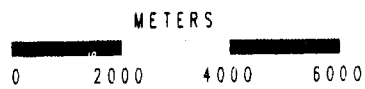


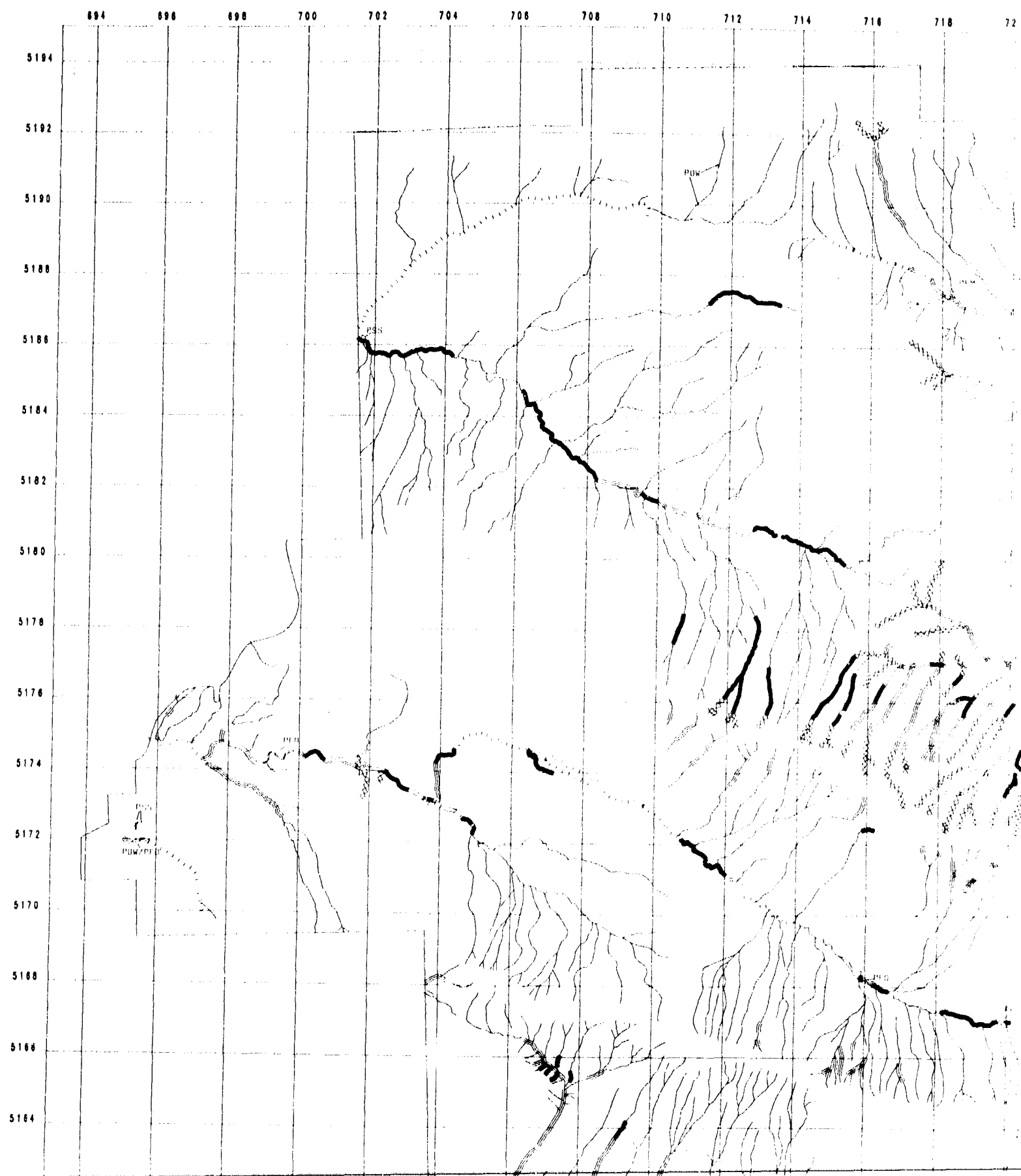
Plate 59. Soil erosion severity for 5-5-0 force structure for one thousand passes



YAKIMA FIRING CENTER
5-5-0 FORCE STRUCTURE
1000 PASSES

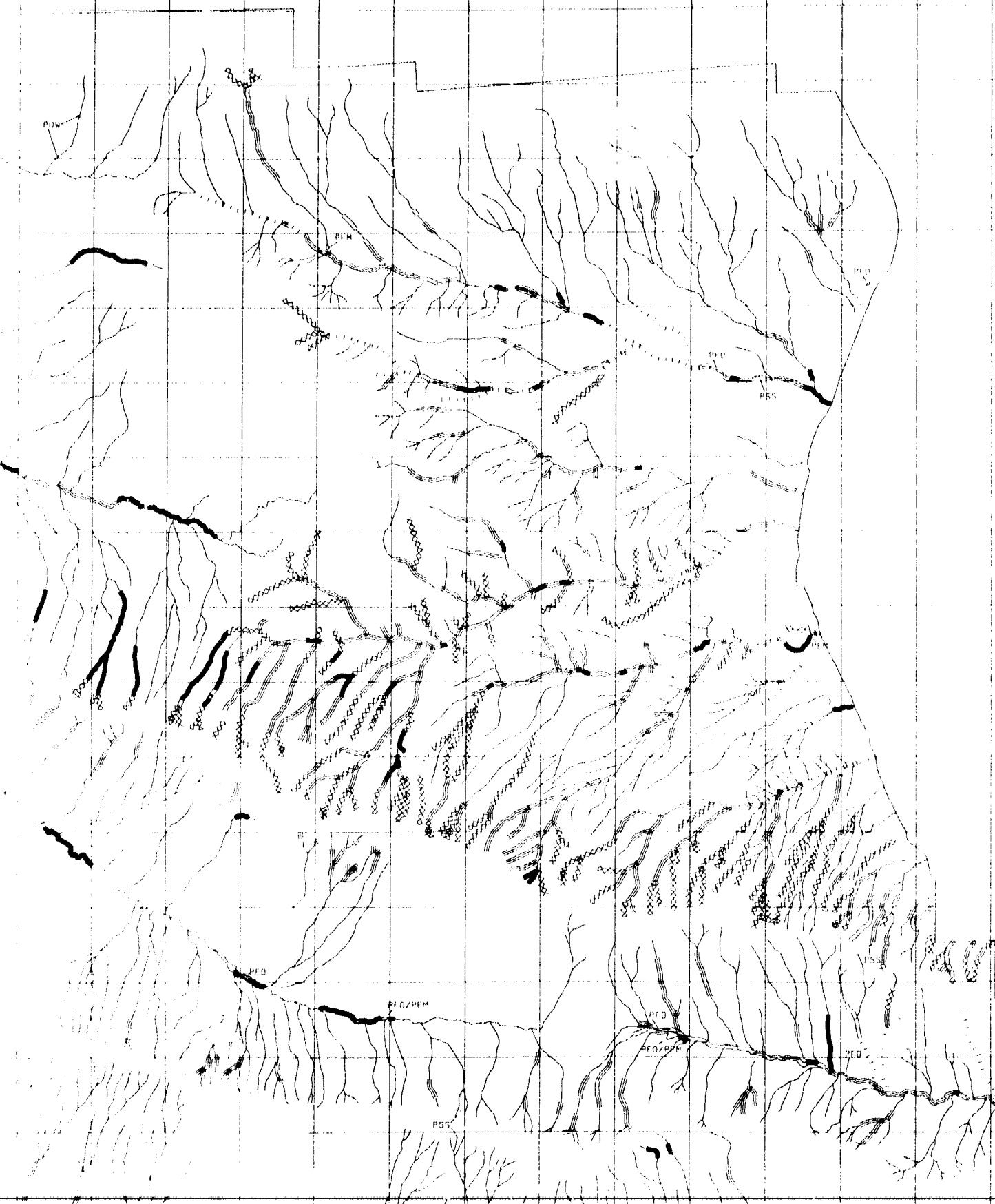


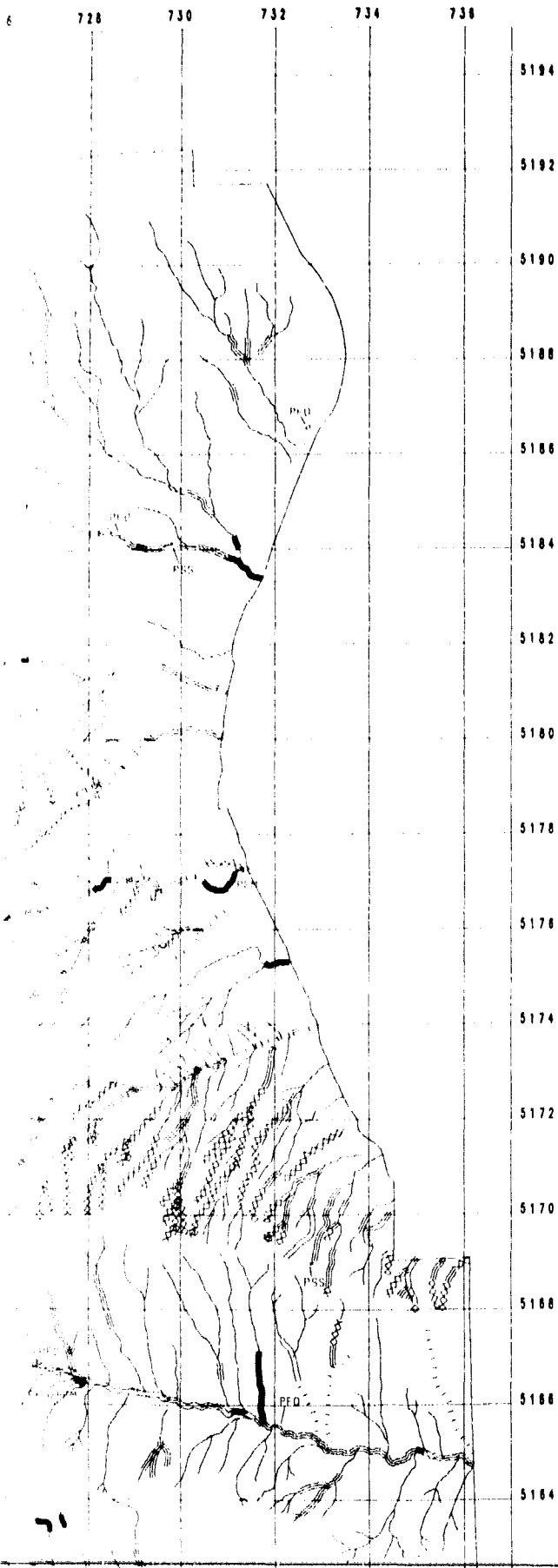
one thousand passes



710 712 714 716 718 720 722 724 726 728 730 732 734 736

5194
5192
5190
5188
5186
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164





U. S. Army Corps of Engineers
Waterways
Experiment
Station

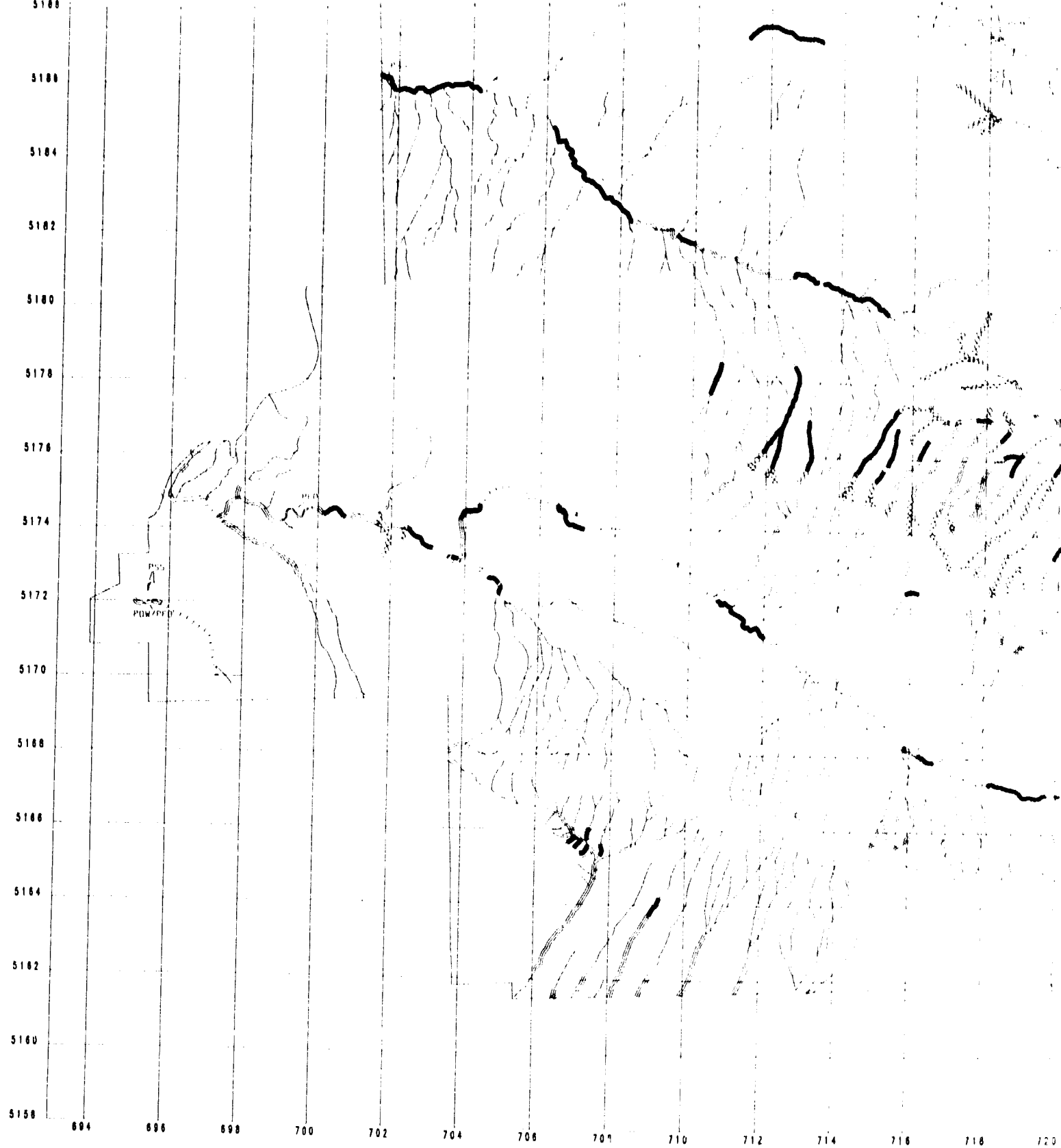
RIPARIAN ZONE CLASSIFICATION

SCALE 1:100000

- PALUSTRINE EMERGENT MARSH (PEM)
- PALUSTRINE FORESTED WETLAND (PFO)
- PALUSTRINE SCRUB/SHRUB WETLAND (PSS)
- RIPARIAN STREAM BED - UNCLASSIFIED (RSB)
- RIPARIAN STREAM BED - EXPOSED ROCK (RSBn)
- RIPARIAN STREAM BED - UPLAND VEGETATION (RSBv)
- RIPARIAN VEGETATION AREAS > 200 FEET WIDE

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON

METERS



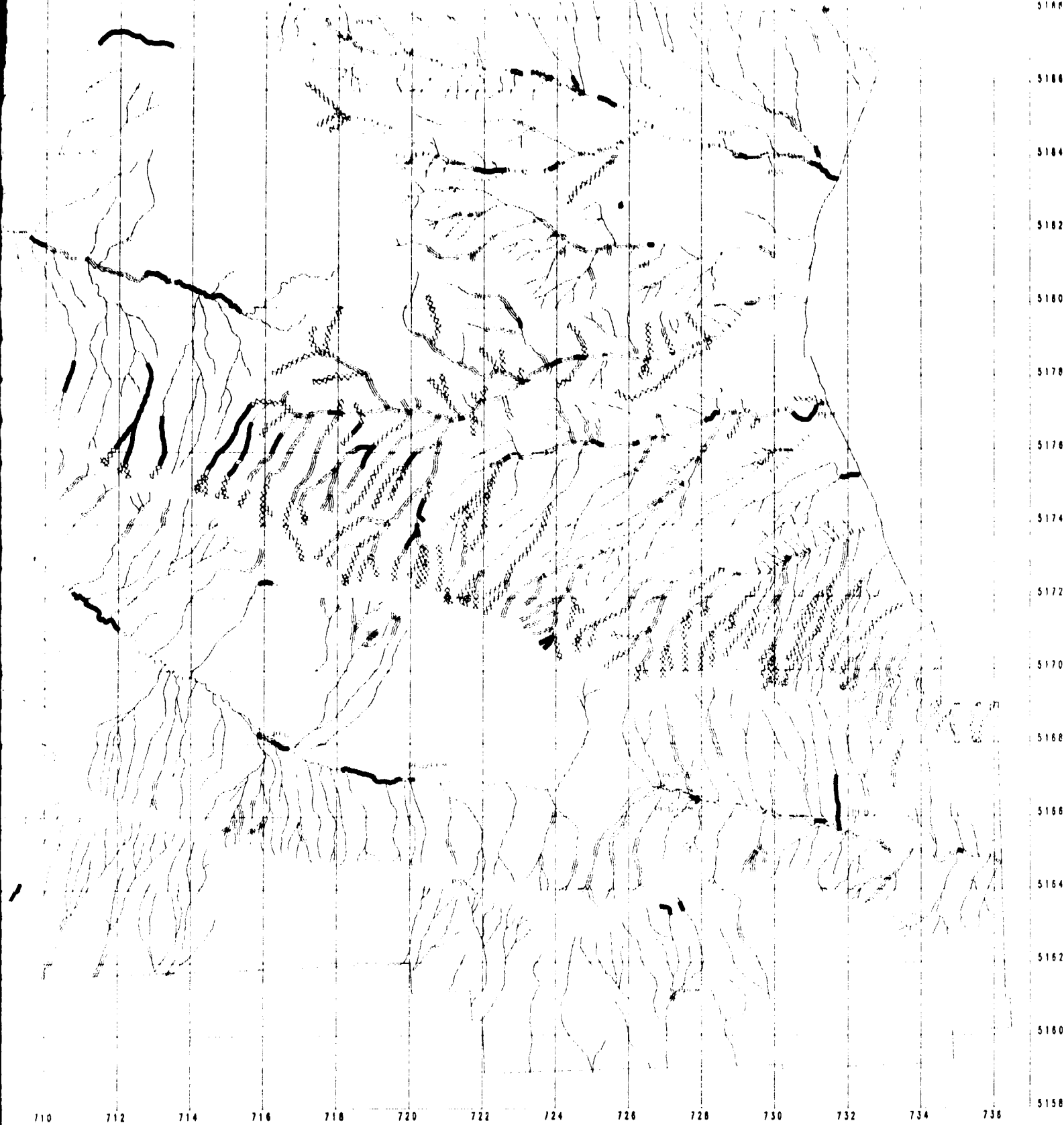
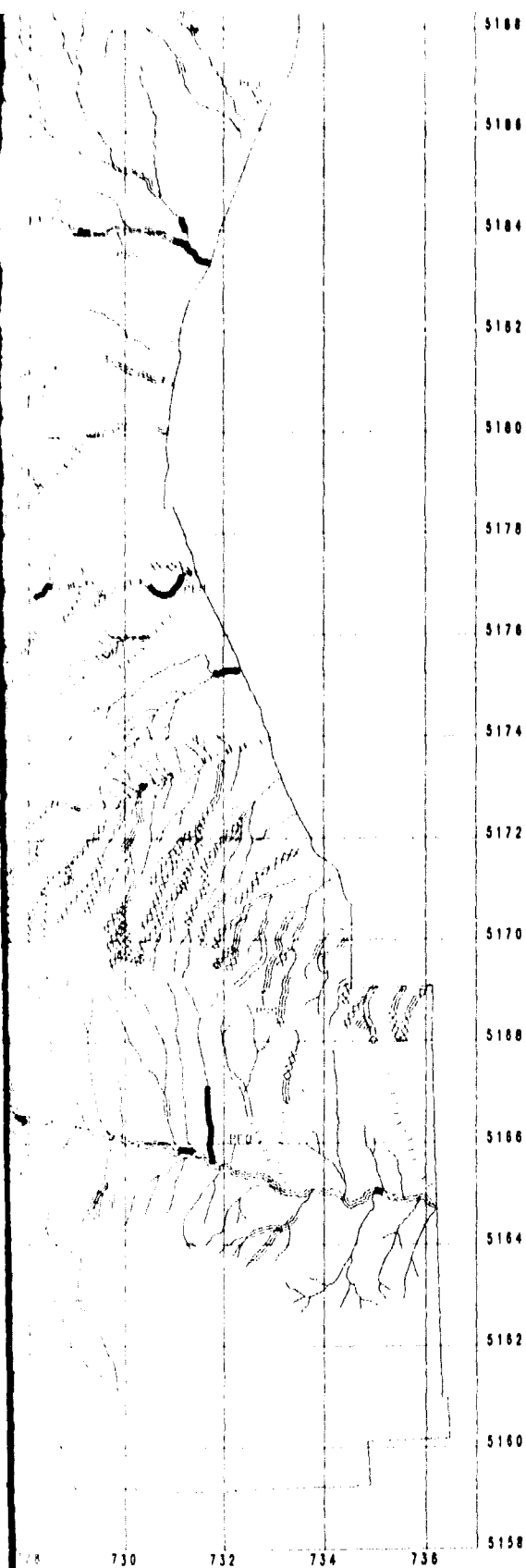







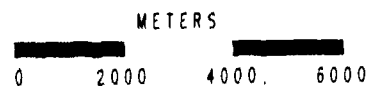


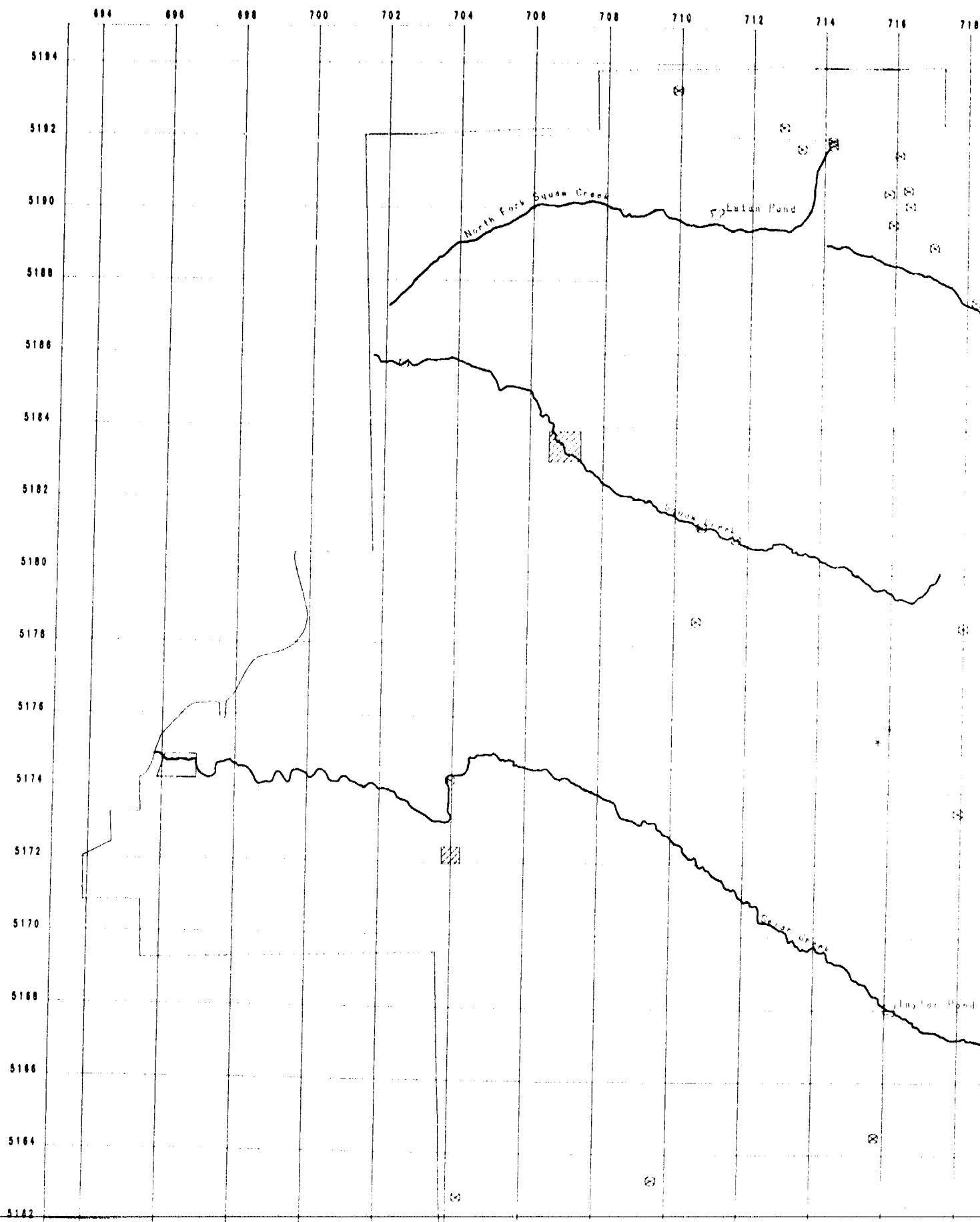
Plate 60. Riparian zone classifications

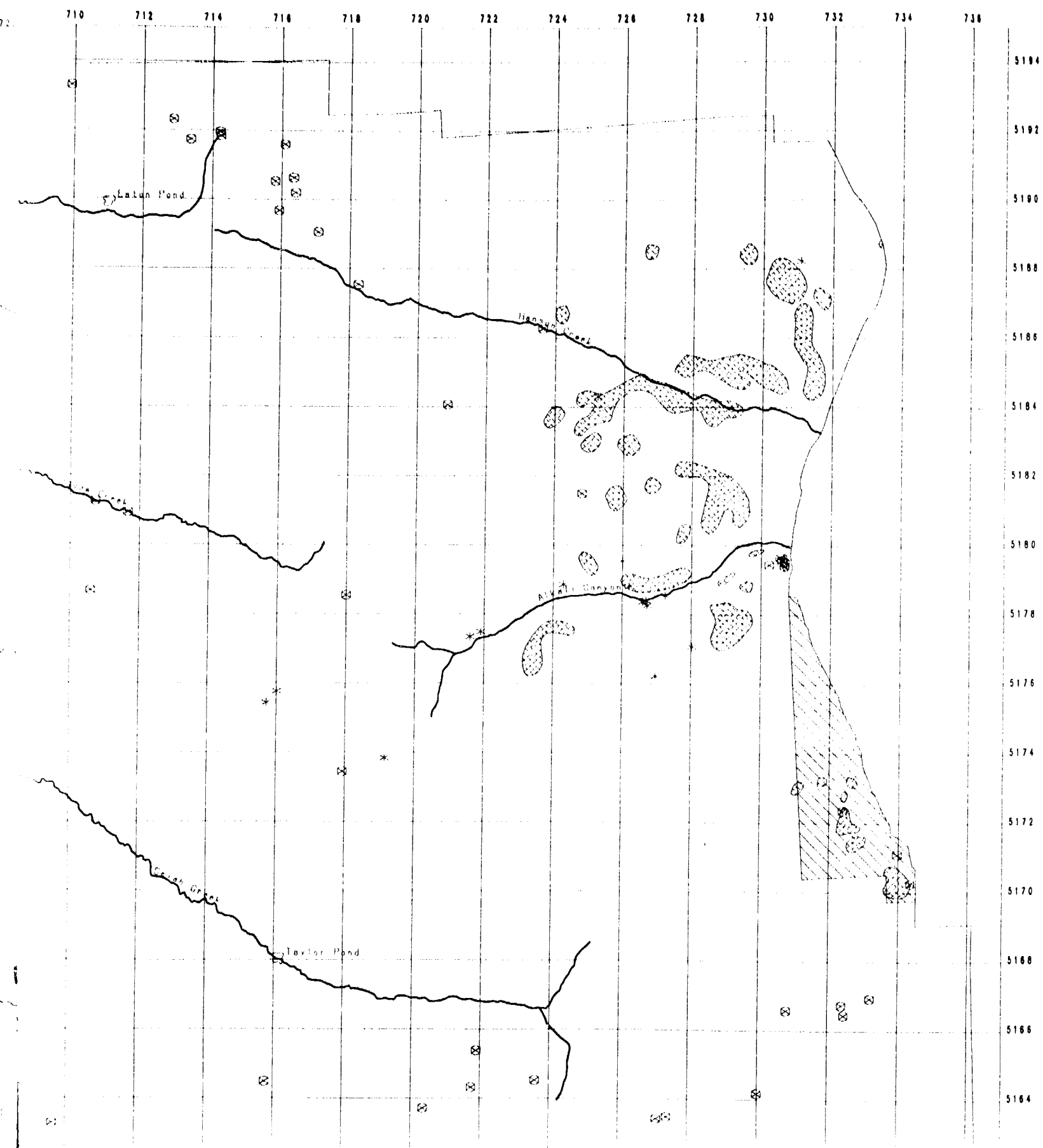


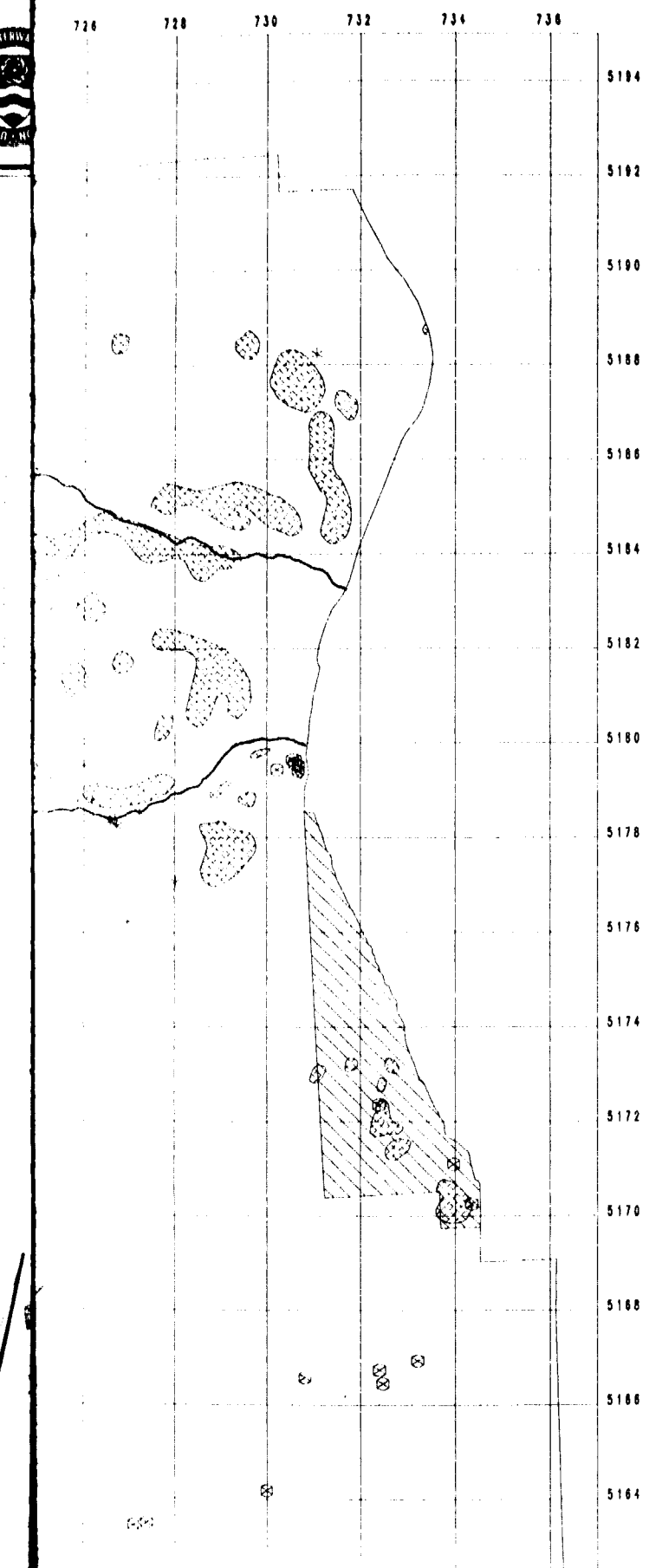
-  PALUSTRINE EMERGENT MARSH (PEM)
-  PALUSTRINE FORESTED WETLAND (PFO)
-  PALUSTRINE SCRUB/SHRUB WETLAND (PSS)
-  RIPARIAN STREAM BED - UNCLASSIFIED (RSB)
-  RIPARIAN STREAM BED - EXPOSED ROCK (RSBn)
-  RIPARIAN STREAM BED - UPLAND VEGETATION (RSBv)
-  RIPARIAN VEGETATION AREAS > 200 FEET WIDE

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON









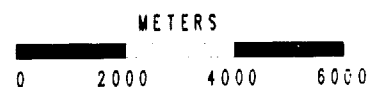
U. S. Army Corps of Engineers
Waterways
Experiment
Station

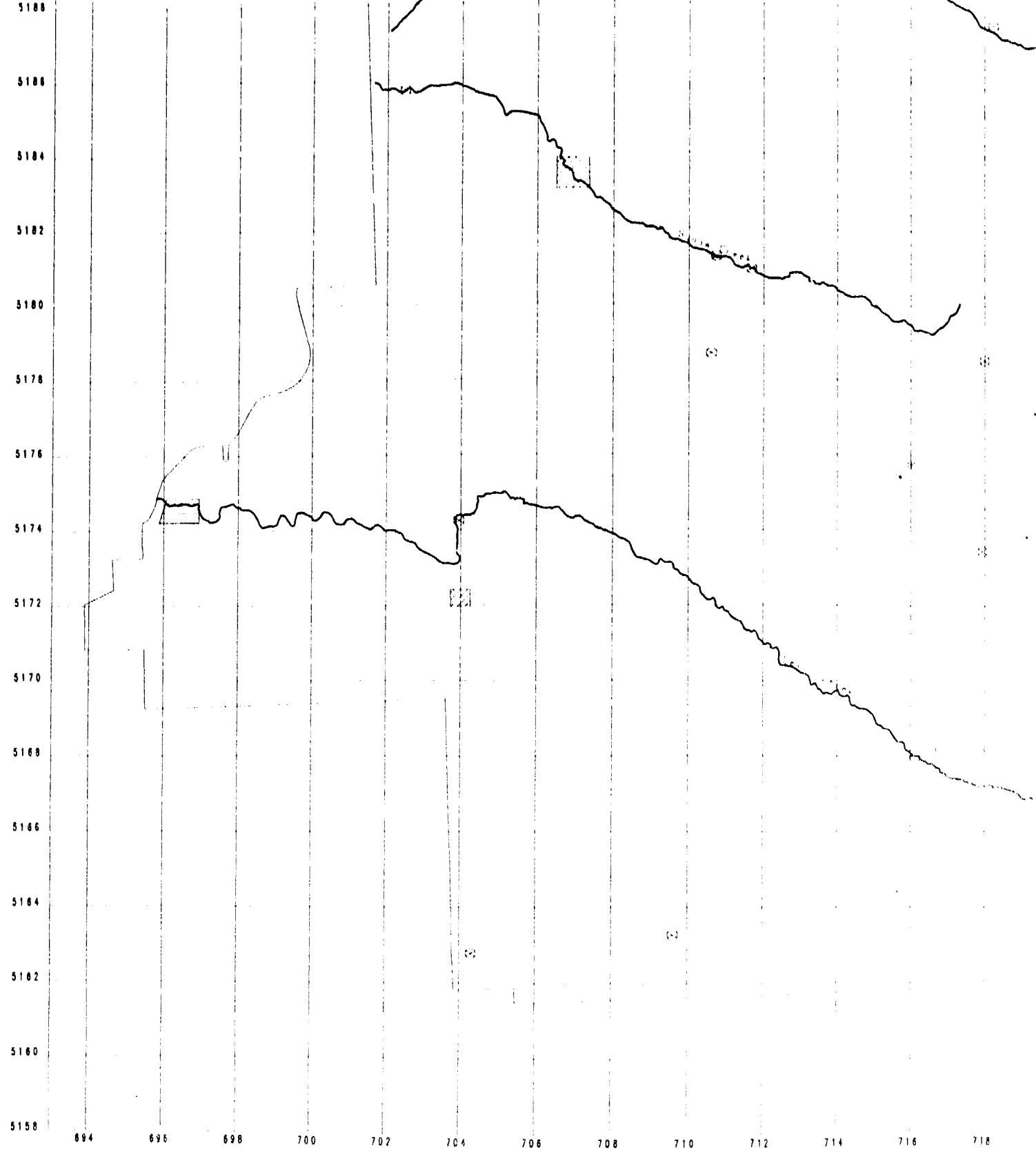
SPECIAL FEATURES - NATURAL

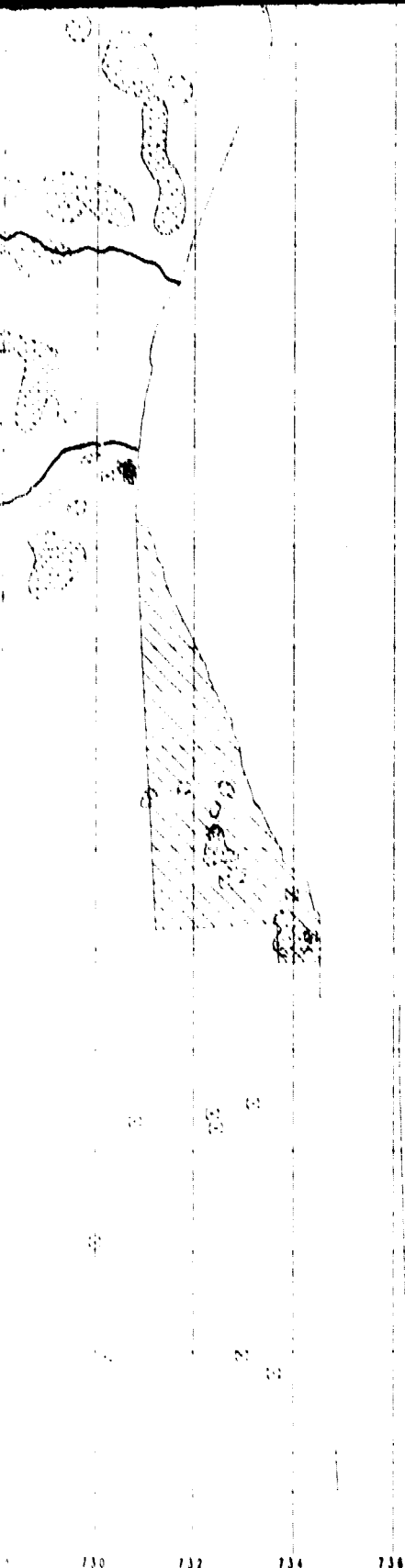
SCALE 1:100000

-  CONFIRMED SEEPS
-  SPRINGS
-  SAGE GROUSE LEK AREA
-  GOLDEN EAGLE NESTING AREA
-  COLUMBIA MILKVETCH
1979 SPECIAL FEATURES MAP
-  COLUMBIA MILKVETCH
1987 SPECIAL FEATURES MAP

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON







5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164

5162

5160

5158

CONFIRMED SEEPS

SPRINGS

SAGE GROUSE LEK AREA

GOLDEN EAGLE NESTING AREA

COLUMBIA MILKVETCH
1979 SPECIAL FEATURES MAP

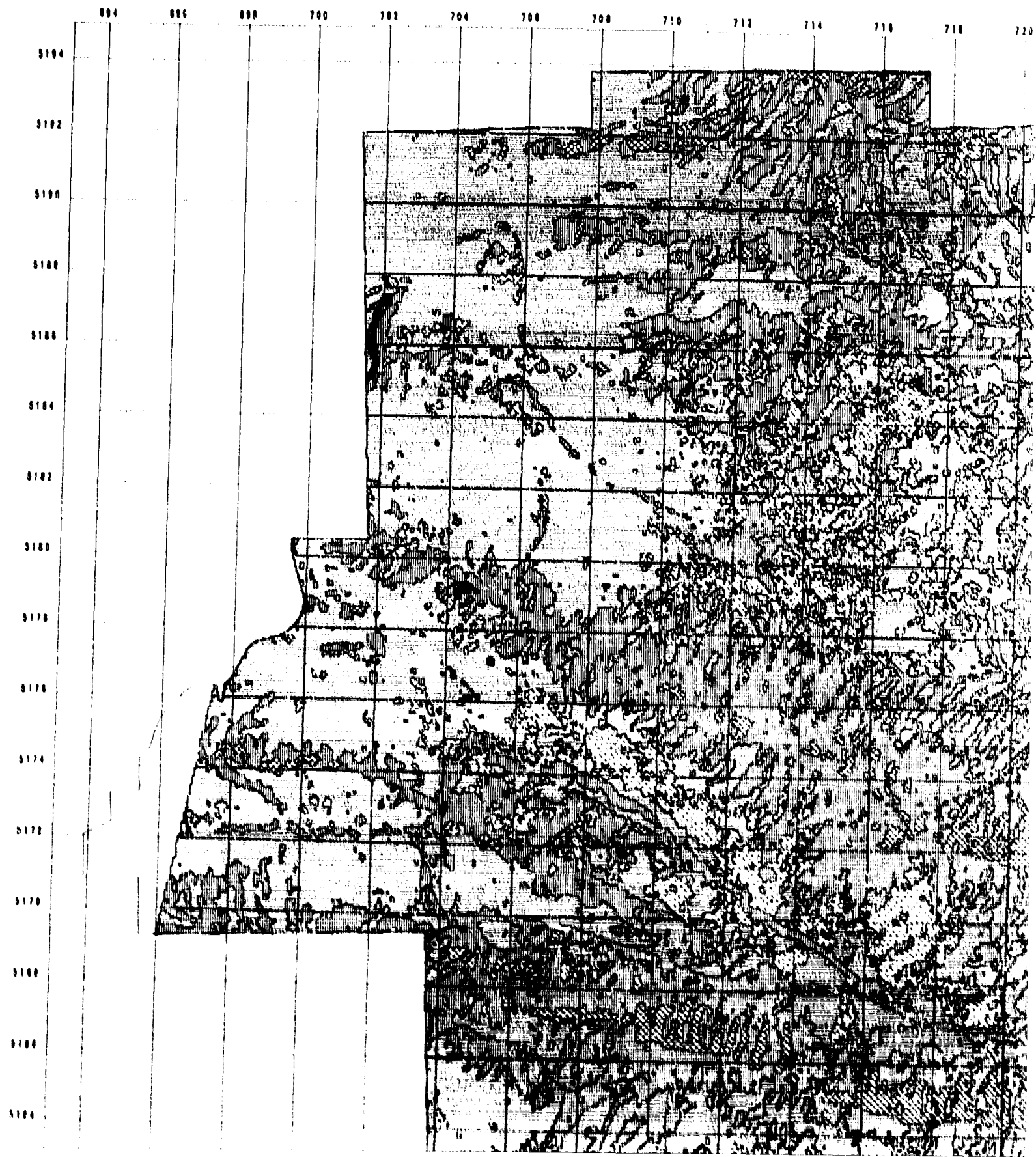
COLUMBIA MILKVETCH
1987 SPECIAL FEATURES MAP

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON

METERS

0 2000 4000 6000

N



0 712 714 716 718 720 722 724 726 728 730 732 734 736



5184
5182
5180
5180
5180
5184
5182
5180
5178
5176
5174
5172
5170
5168
5166
5164



730 732 734 736

8194

8192

8190

8188

8186

8184

8182

8180

8178

8176

8174

8172

8170

8168

8166

8164



U. S. Army Corps of Engineers
Waterways
Experiment
Station

LANDSAT CLASSIFICATION

SCALE 1:100000



SHRUBS/WHEATGRASS/SANDBERG BLUEGRASS



OPEN WATER



EXPOSED ROCK



WHEATGRASS/SANDBERG BLUEGRASS/CHEATGRASS



CHEATGRASS



SAND DUNES/SURFACE MINES



BLUEBUNCH WHEATGRASS



AGRICULTURAL/RIPARIAN



SANDBERG BLUEGRASS/STIFF SAGE

YAKIMA FIRING CENTER

YAKIMA, WASHINGTON

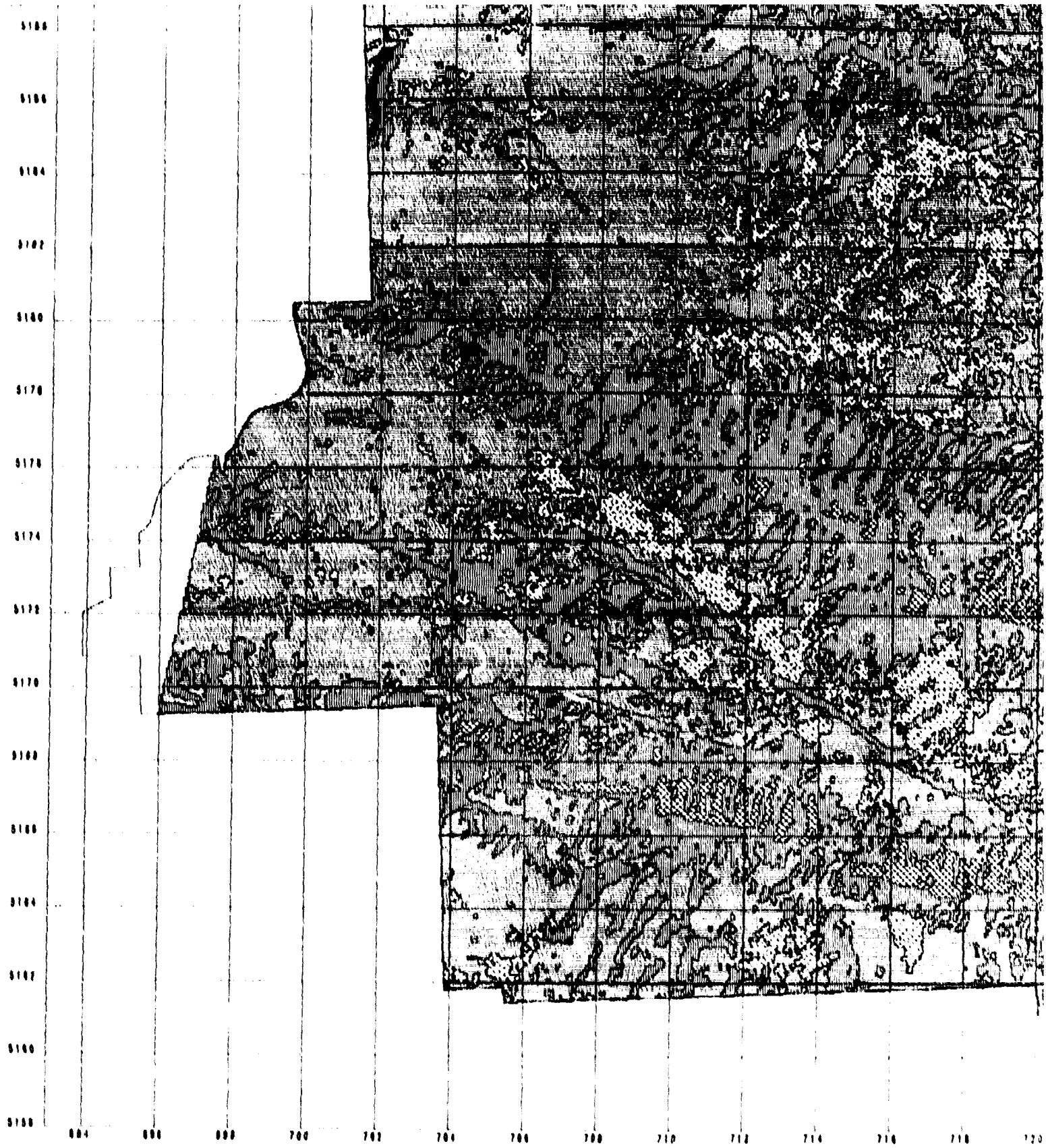


Plate 62. LANDSAT cl

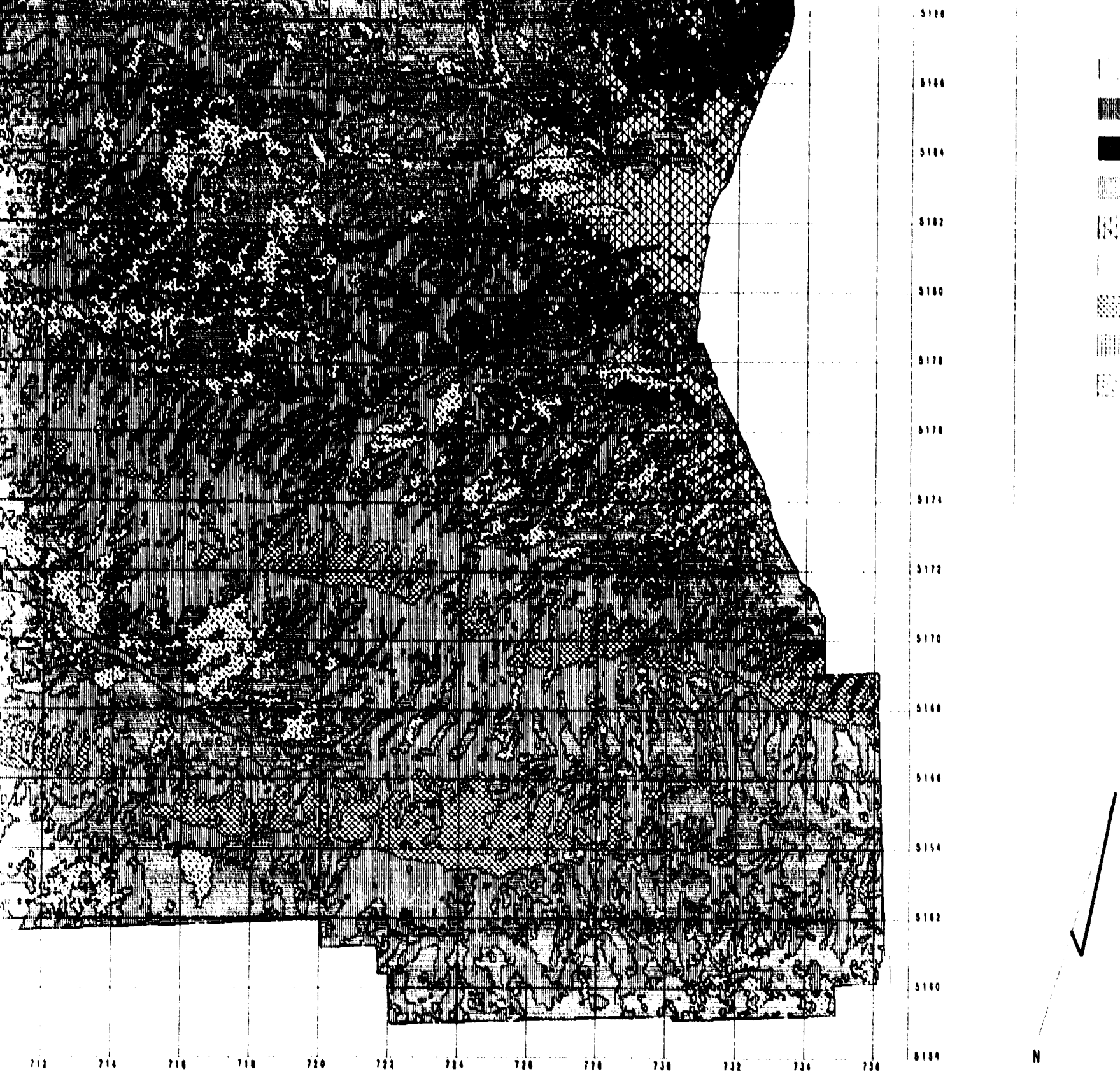
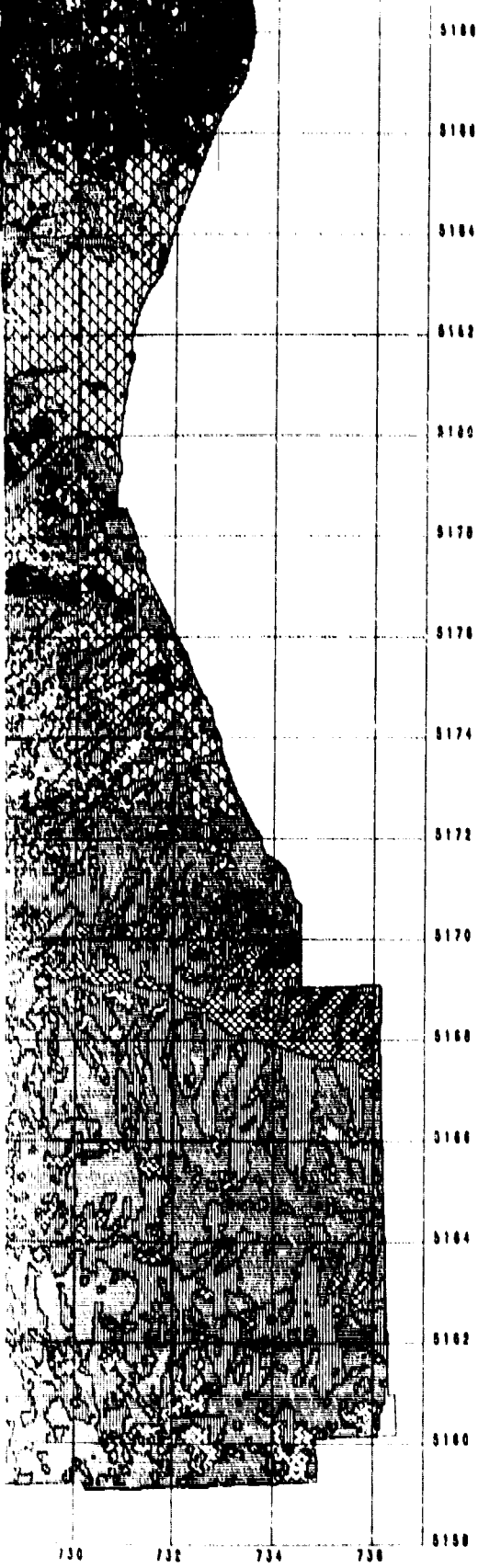











Plate 62. LANDSAT classifications (vegetation associations)

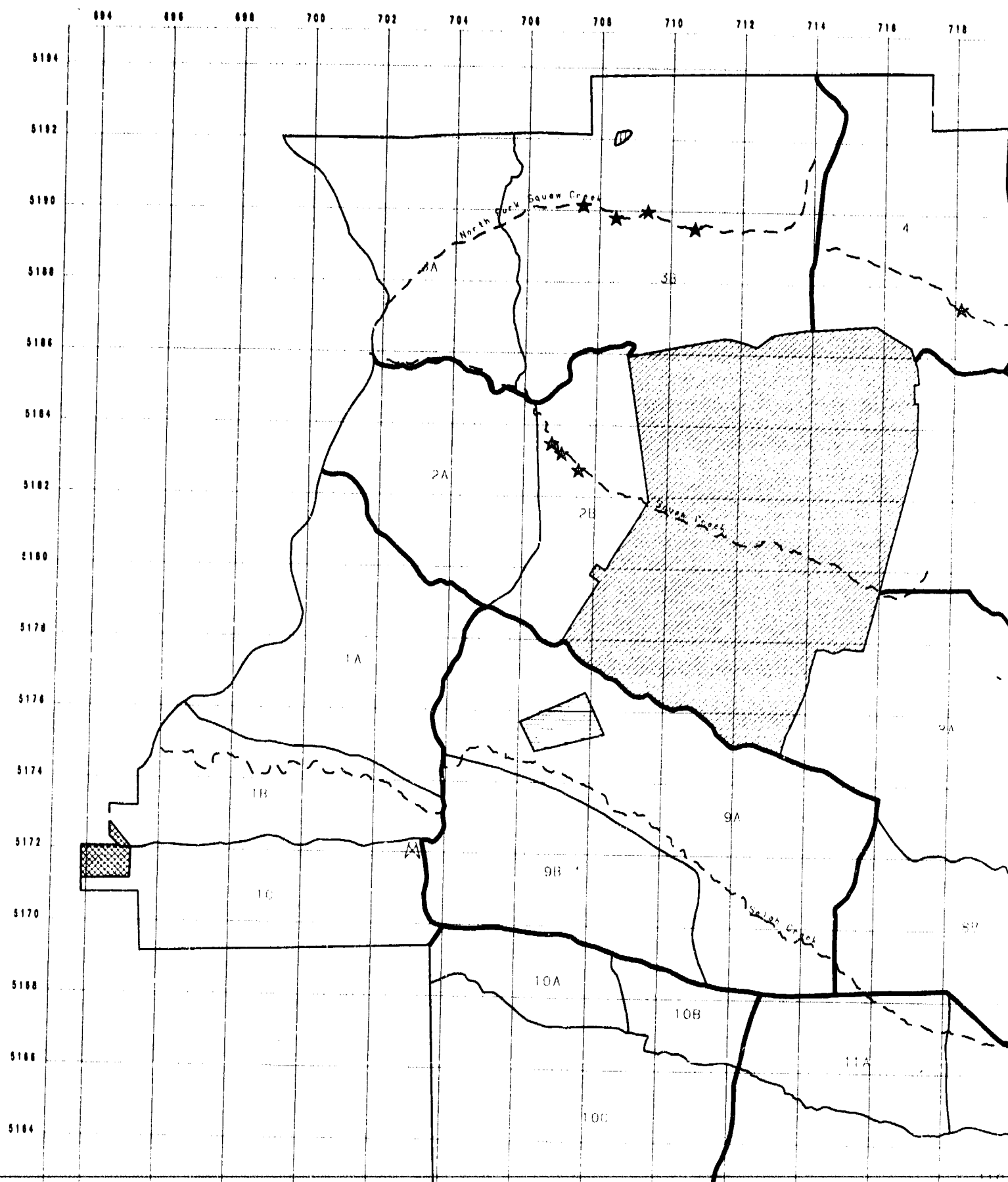


-  SHRUBS/WHEATORASS/SANDBERG BLUEGRASS
-  OPEN WATER
-  EXPOSED ROCK
-  WHEATORASS/SANDBERG BLUEGRASS/CHEATORASS
-  CHEATORASS
-  SAND DUNES/SURFACE MINES
-  BLUEBUNCH WHEATORASS
-  AGRICULTURAL/RIPARIAN
-  SANDBERG BLUEGRASS/STIFF SAGE

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON



ations)



712 714 716 718 720 722 724 726 728 730 732 734 736

5194

5192

5190

5188

5186

5184

5182

5180

5178

5176

5174

5172

5170

5168

5166

5164



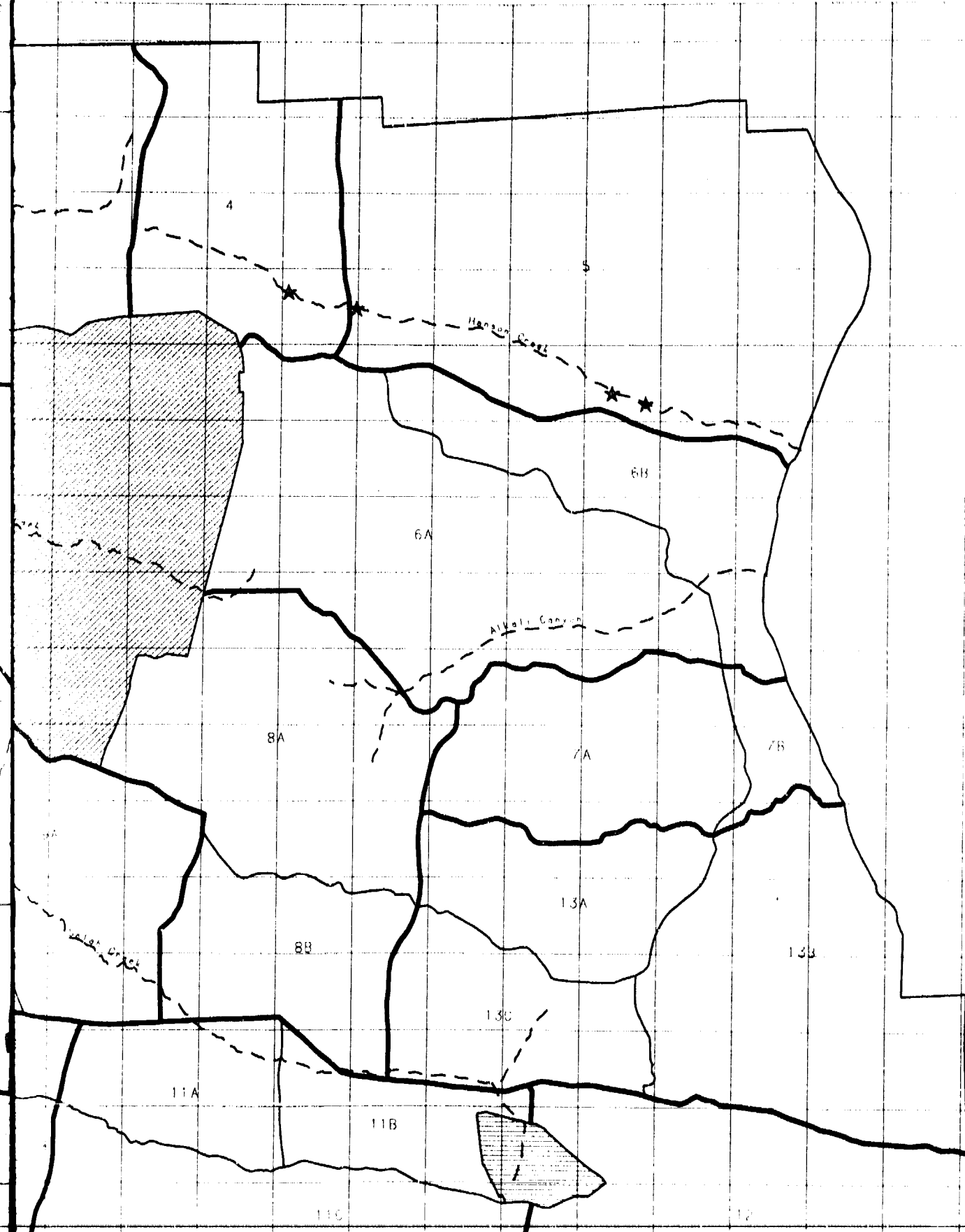
SP

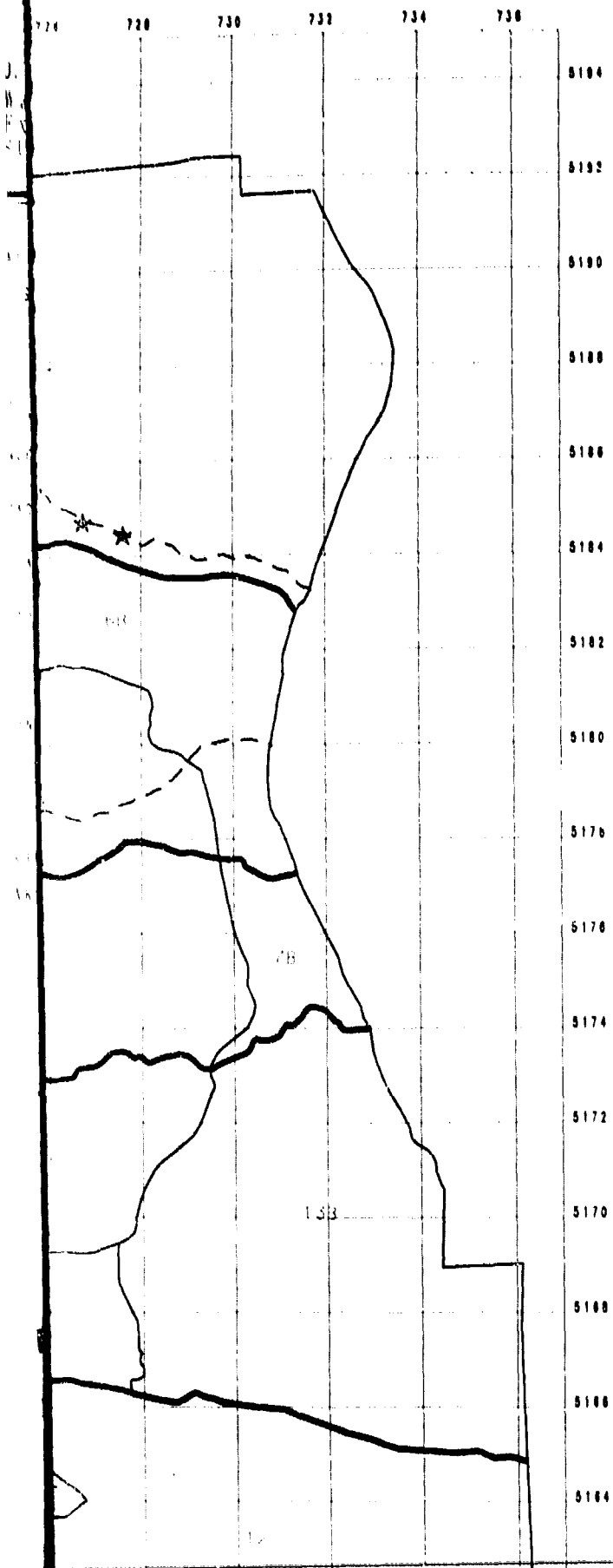
★

M










1A-13C



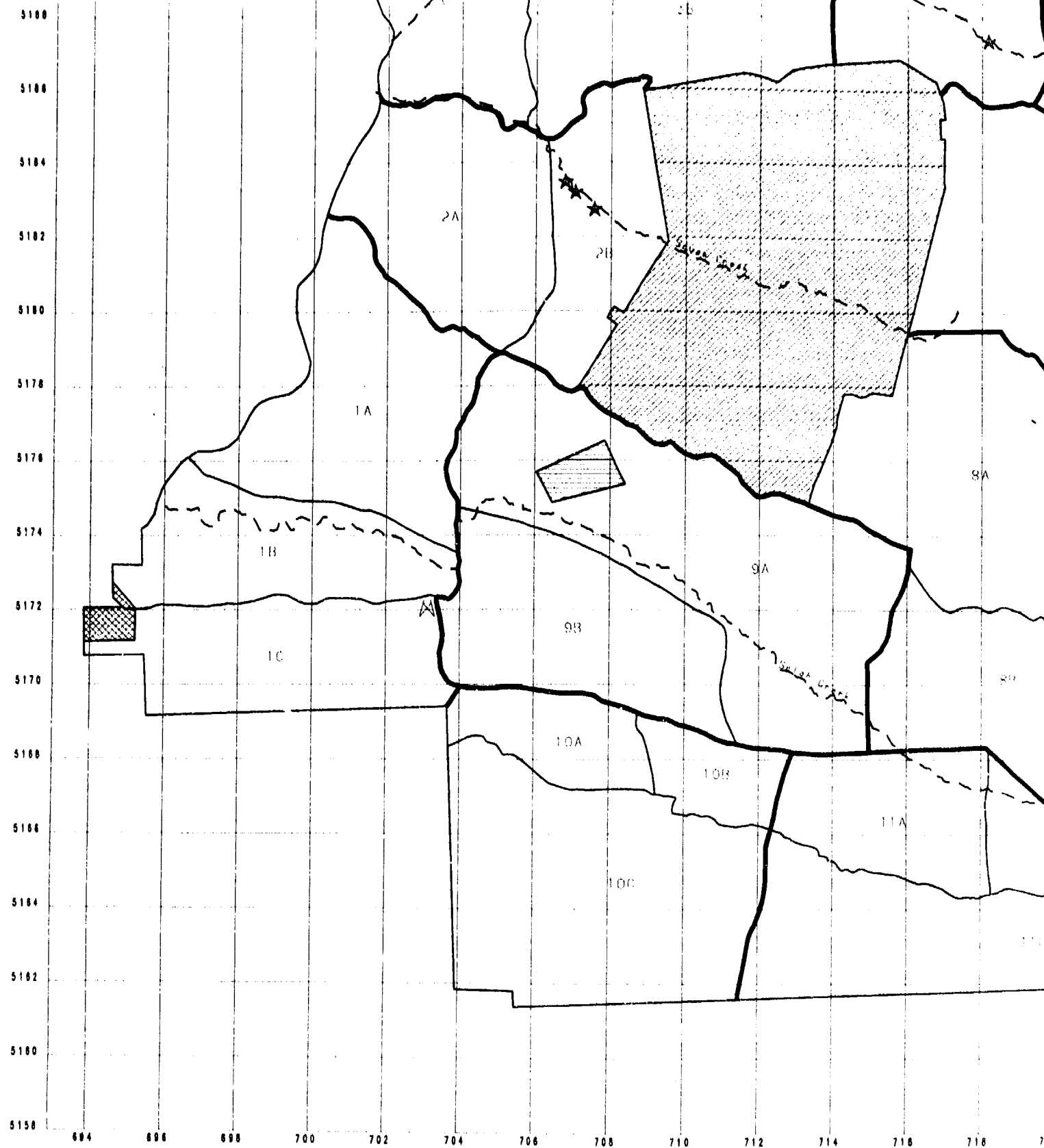


U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPECIAL FEATURES - MILITARY
SCALE 1:100000

-  FORD
-  RANGE CENTRAL
-  IMPACT AREA
-  DUD AREA
-  CANTONMENT
-  BIVOUAC SITE
-  TRAINING AREAS

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON



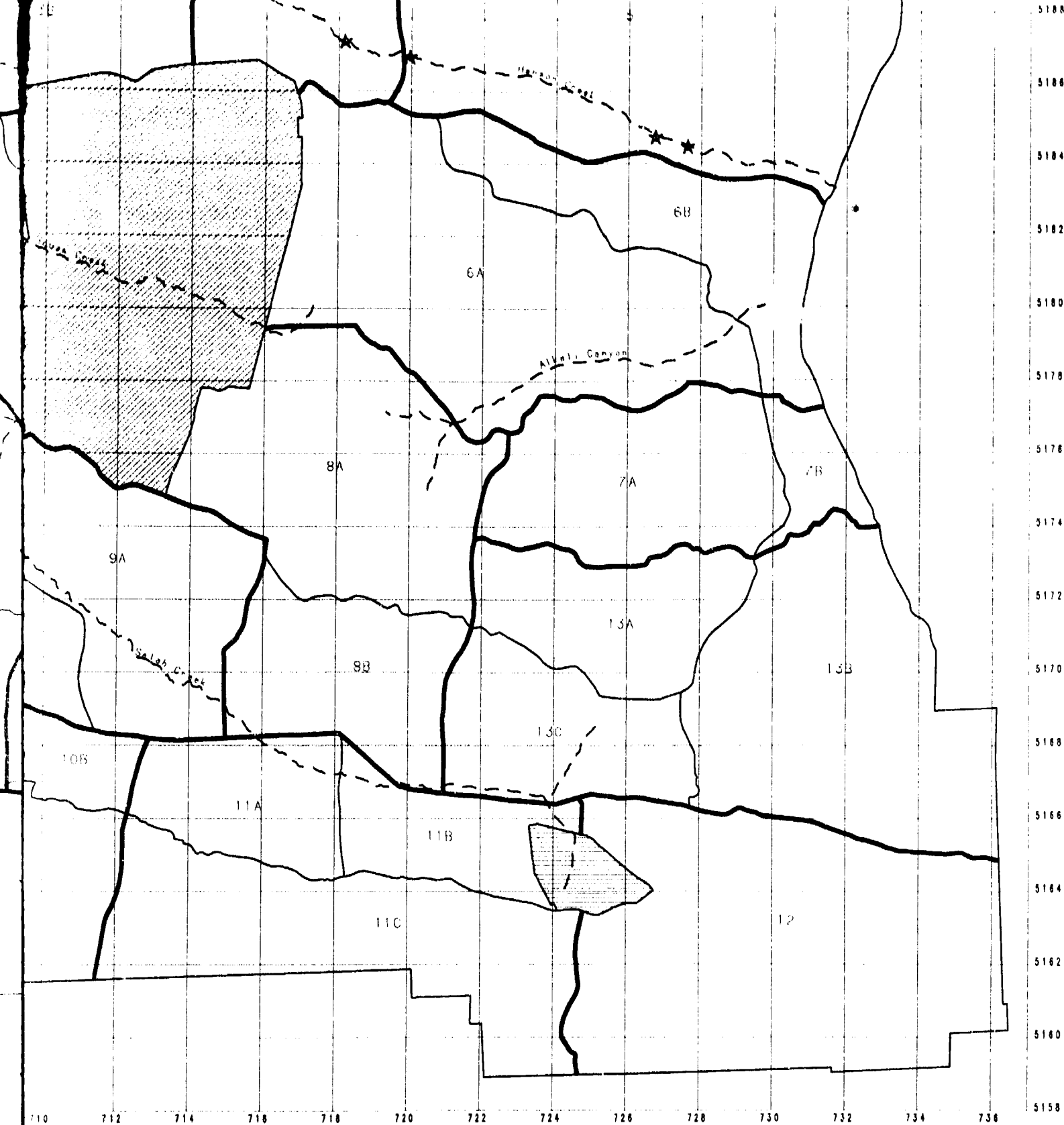
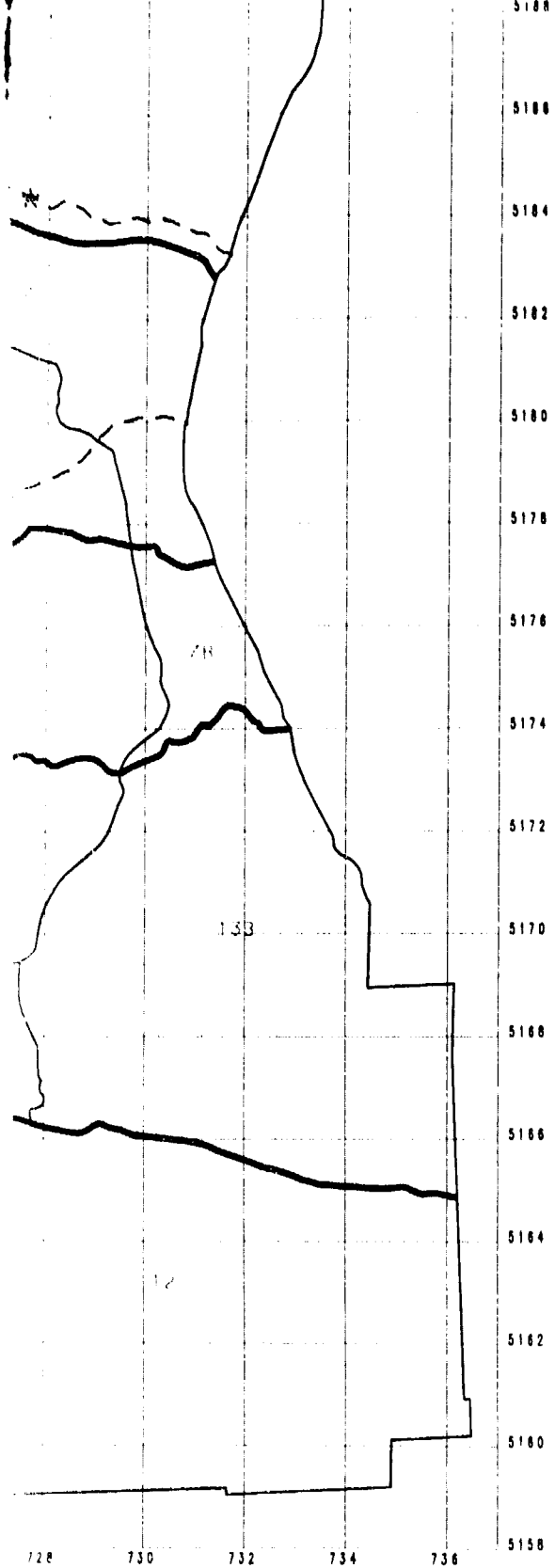
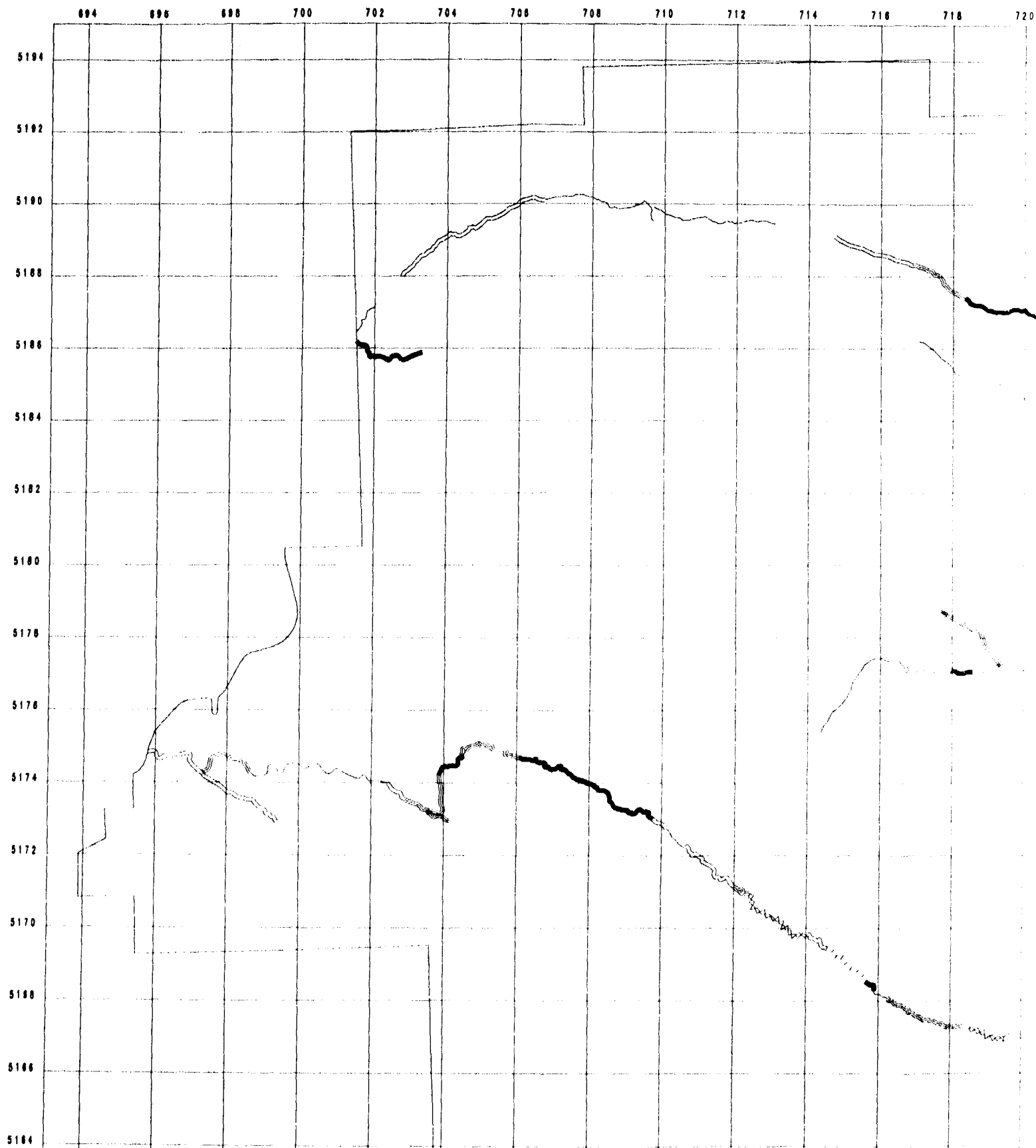
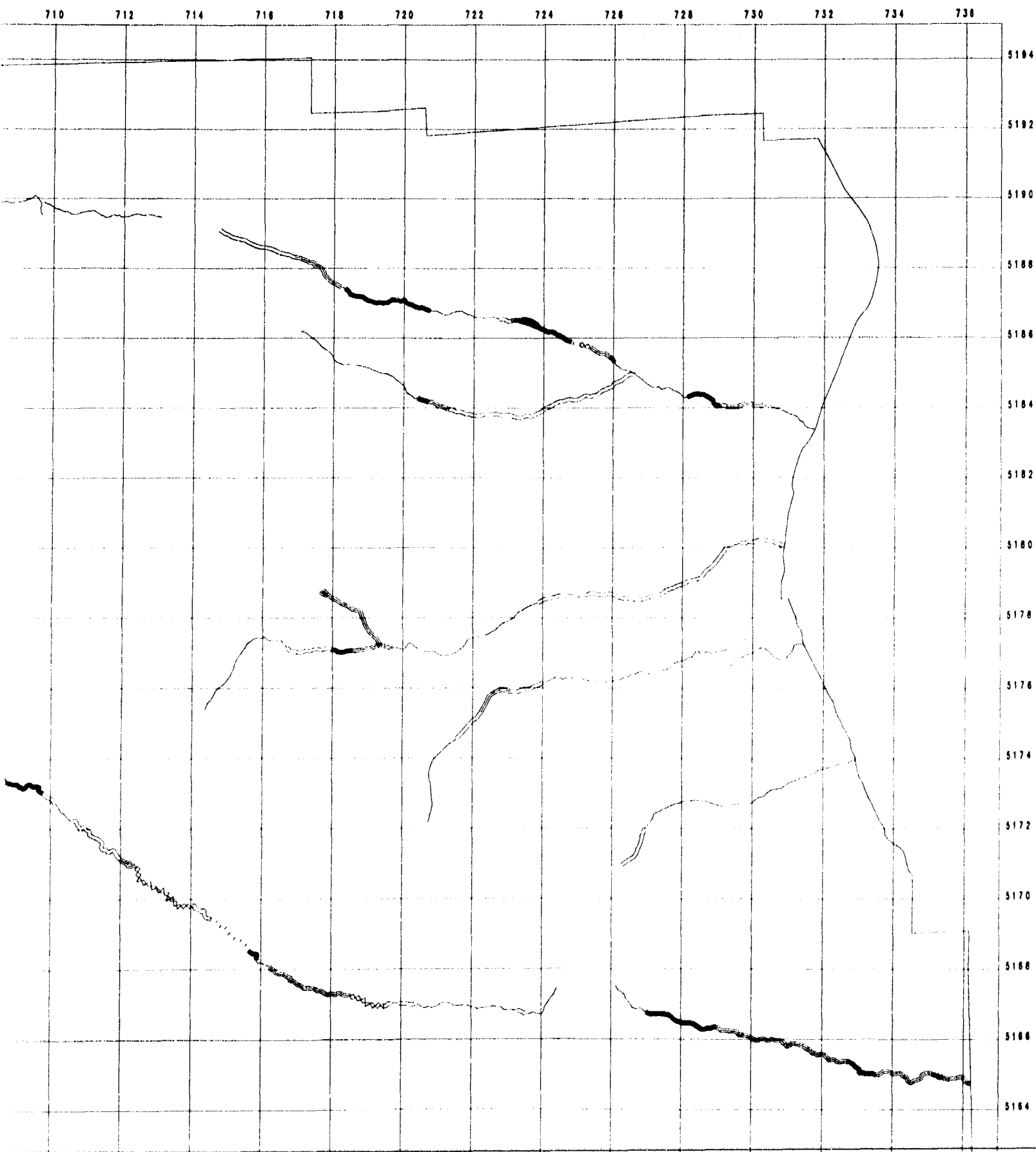


Plate 63. Special features - military







730 732 734 736

5104

5102

5100

5108

5106

5104

5102

5100

5170

5176

5174

5172

5170

5108

5106

5104



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RIPARIAN ZONE -
CATEGORIES OF EROSION
SCALE 1:100000

- EROSION DEPTH 0-2 FEET
- EROSION DEPTH 2-6 FEET
- EROSION DEPTH 2-8 FEET
WITH UNPAIRED TERRACES
- EROSION DEPTH 8-12 FEET
- EROSION DEPTH 8-12 FEET
WITH UNPAIRED TERRACES
- EROSION DEPTH >12 FEET

YAKIMA FIRING CENTER
YAKIMA, WASHINGTON

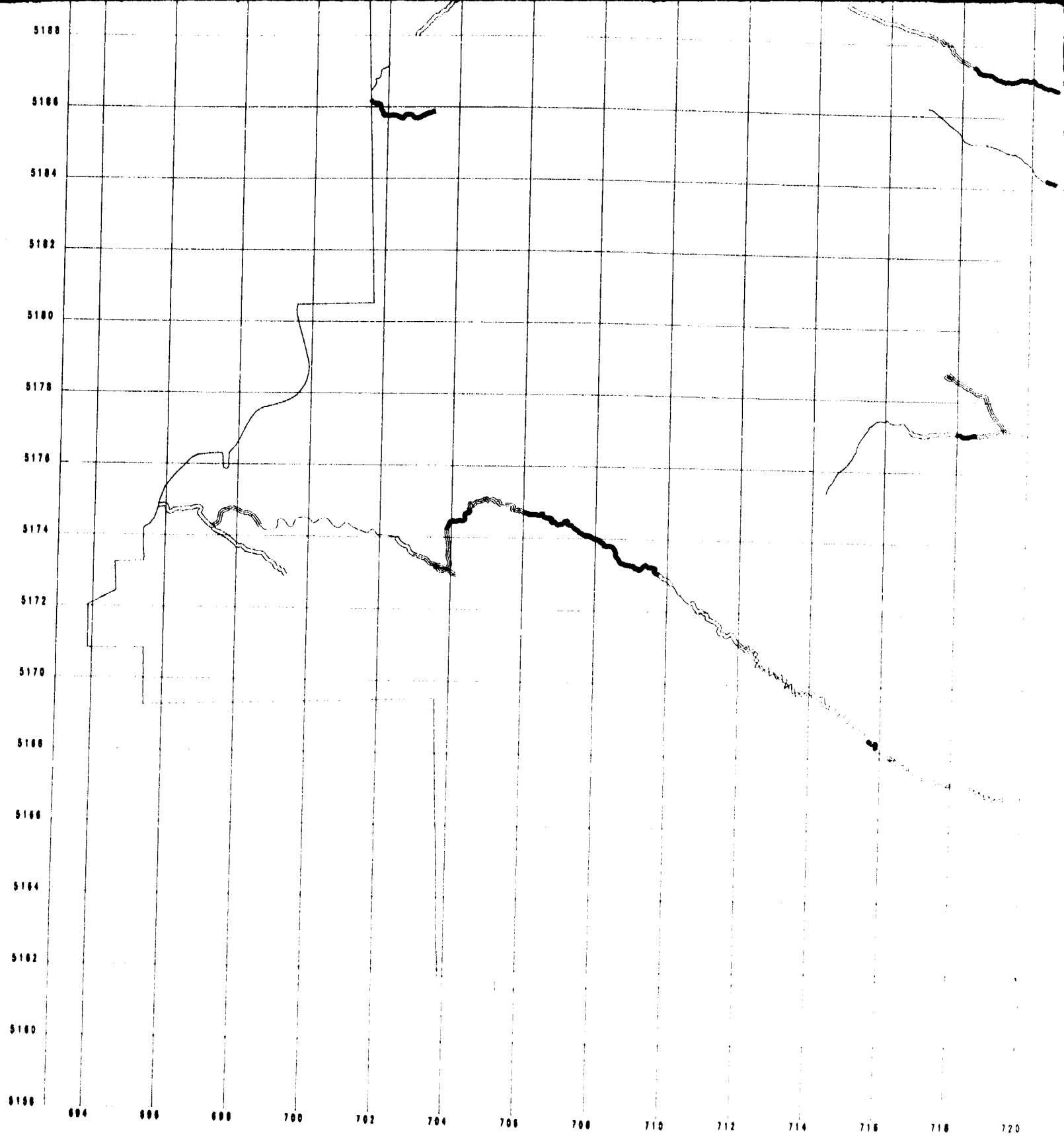


Plate 64. Riparian :

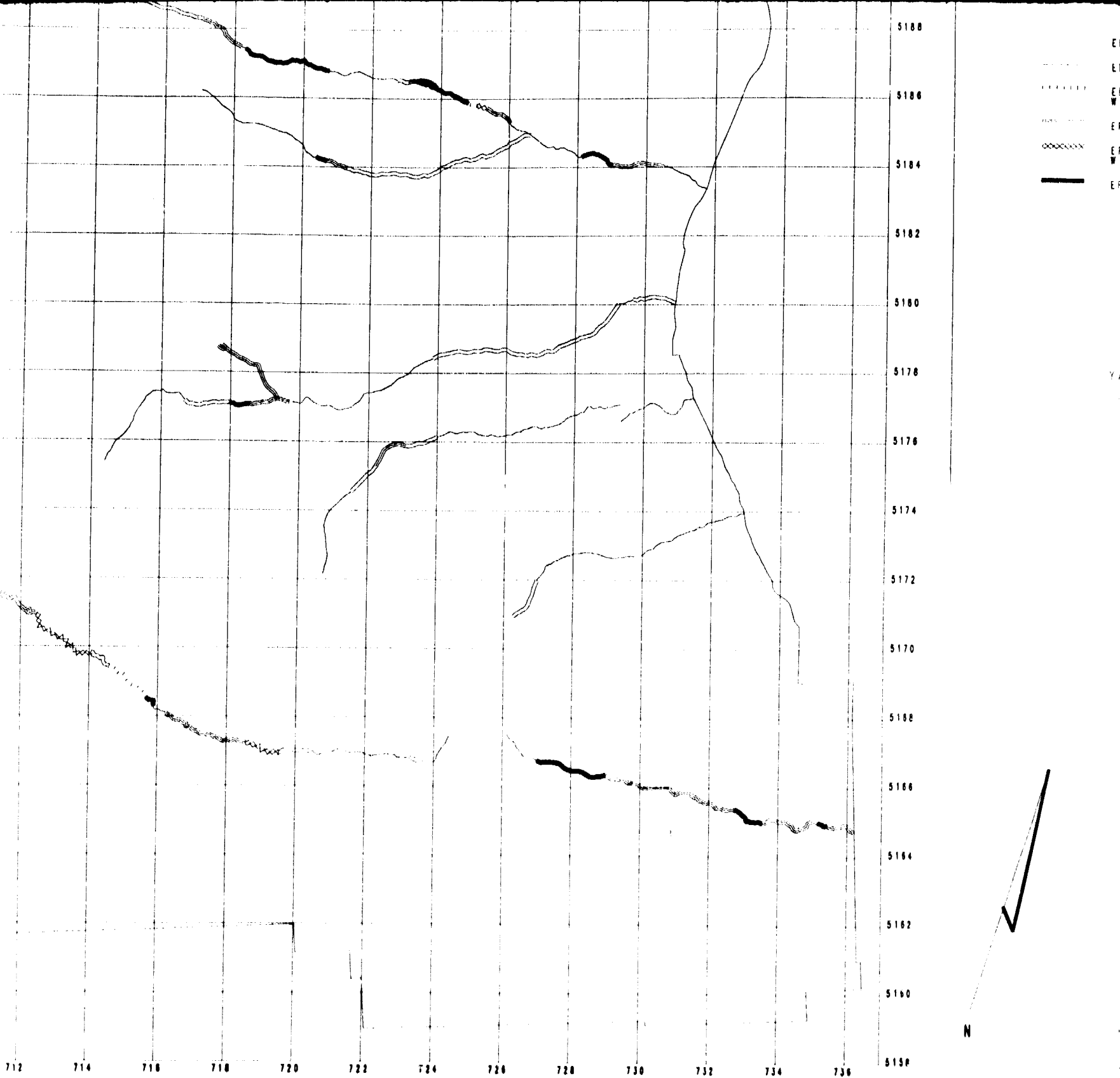


Plate 64. Riparian zone - categories of erosion

